INTEGRATED QUALIFICATIONS SYSTEM

UPDATED SECTORAL QUALIFICATIONS FRAMEWORK FOR WASTE MANAGEMENT (SQF WM)

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1. Definition of the sector

The Sectoral Qualifications Framework for the Waste Management Sector (SQF WM) includes the competences required to plan, organise, implement and supervise waste management and waste prevention processes in accordance with the principles of a circular economy. It includes the competences required to conduct reporting activities, to educate and raise the awareness of residents, entrepreneurs, producers and representatives of state and local government institutions about the circular economy, as well as to counteract climate change and to implement the principles of sustainable development.

2. Practical application of the Sectoral Qualifications Framework for the Waste Management Sector

The Sectoral Qualifications Framework for Waste Management (SQF WM) is a universal tool for managing the competences in the energy sector. Due to the fact that the structure of SQF WM does not impose specific business solutions, it can be used in any number of ways by many different audiences.

Employers

With the help of SQF WM, employers can take a broader view of the industry competences present in their business environment, enabling them to manage their human resources more efficiently and compete more effectively in the labour market. The main advantages of using this tool include support in analysing competence gaps in the industry or company, planning human resource development and the salary grid of job positions, as well as gaining help with recruitment and the selection of personnel.

The table of competences allowed me to determine the criteria for recruiting staff based on the key competences in the industry, as well as to prepare job descriptions.

After identifying the main competence gaps in the industry, we launched an apprenticeship programme to prepare our students to successfully enter the labour market.

Schools and educational institutions

On the basis of SQF WM, schools and educational institutions can adapt the curricula they offer to the current and real needs of the labour market. This means that the table of competences supports these institutions in expanding and modifying their teaching programmes and filling in the competence gaps of students, for example, those relating to practical or soft skills. Additionally, it can be a useful tool in career counselling for students or in monitoring the success of school leavers.

Higher education institutions

SQF WM is a tool that supports higher education in aligning their study programmes with current trends in industry development. This enables students to be better prepared to enter the labour market and achieve career success. The table of competences also makes it possible to monitor students' progress and evaluate the effectiveness of study programmes.

We used SQF WM to analyse students' level of skills against those needed by the waste management industry and the effectiveness of our study programmes.

By better matching the needs of our customers, we have become more competitive in the training market.

Training companies

By using SQF WM, training companies can effectively design specialised courses, enabling them to prepare a tailor-made offer for a specific sector and to meet the expectations of their clients. With the help of the sectoral qualifications framework, they can select individual competences and match them to the outcomes of a given training programme. They can also prepare exams to assess knowledge, skills and social competences. The gradation of the complexity of competences in SQF WM also makes it easier to prepare training offers at various levels of proficiency.

IQS stakeholders

Among the broad audience of IQS users, the groups most likely to benefit from the SQF WM are primarily industry organisations and those describing market or sectoral qualifications. Among others, industry organisations are tasked with establishing educational agreements that strengthen cooperation between schools and employers, as well as providing information on the demand for sectoral competences to educational institutions and labour market institutions. In turn, persons describing market or sectoral qualifications can use the framework to more easily define sets of learning outcomes.

Other entities

SQF WM can be used for many other purposes depending on the current needs of the industry. In the waste management sector, it can be used as a supplementary tool to prepare methods for assessing the knowledge of a company's employees on safety, since every employee is exposed to accidents in the workplace today. Verifying employees' basic competences for the sector can protect a company from negative consequences in the future.

Moreover, the waste management sector is currently facing a shortage of skilled workers. The Sectoral Qualifications Framework for Waste Management can be used to retrain and launch the professional careers of people from related sectors.

As an occupational health and safety specialist, I often use the SQF WM. Analysing the 'Safety' determinant allowed me to quickly identify the competences I should be developing among waste management employees in my training courses.

3. Instructions for using the Sectoral Qualifications Framework for Waste Management

1 Familiarise yourself with the sectoral determinants, as they indicate the main areas of the sector's activities.

2 Familiarise yourself with the competence series, as they further describe each sectoral determinant.

3 Familiarise yourself with the competences in a given series.

The competences in the SQF at particular levels correspond to second stage Polish Qualifications Framework levels for vocational education and training

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
SECTORAL DETERMINANT I.	knows and understands...								
	is able to...								
SECTORAL DETERMINANT II.	knows and under-								
	is able to...								
SECTORAL DETERMINANT III.	knows and under-								
	is able to...								
SECTORAL DETERMINANT IV.	is ready to....								

Competences are grouped into their appropriate categories by colour:

knowledge (knows and understands...),

skills (is able to...),

social competence (is ready to...).

Important!
A specific process can often be fully described only by combining competence series from the categories of **knowledge** and **skills**.

Remember!
Green competences are designated in bold and indicated as **(GC)** in front of the description.

4. Updated Sectoral Qualifications Framework for Waste Management indicating the green competences identified in the sector

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
I. Waste, materials, products	knows and understands...	**Types of waste**	**(GC) the types of waste, distinguished by, e.g., the sources of their production, properties, usefulness, degree of nuisance, risks to human health or life, property, the environment, etc.**	data on waste produced in the economy, e.g., statistical data, research data, publications, reports	**(GC) the factors influencing the type, composition, structure, ecodesign and recyclability of produced waste**	the theories on the relationship between the type, composition and structure of waste streams and the type of entity, local conditions and other factors	**(GC) the mechanisms shaping produced waste streams in terms of their qualitative, economic, environmental and circular economy aspects**	**(GC) the predicted changes relating to the types, composition and structure of produced waste, including forecasts about new types of waste, taking into account feedback to producers on ecodesign and the circular economy**	
		Properties of waste	the parameters characterising waste and waste streams (e.g., moisture content, composition)	**(GC) the properties of waste, including physicochemical, biological, energy**	**(GC) the factors influencing the qualitative parameters and economic properties of waste as well as its recyclability**	the standards defining the qualitative parameters of waste and waste streams; **(GC) the rules for determining the compliance of waste properties with national and EU standards in terms of the circular economy and sustainability;** the requirements for the qualitative parameters of waste and waste streams			
		Testing waste		the aim and types of waste testing, the parameters of the waste to be tested	the principles of testing waste, including the requirements of laboratories performing tests, the methods and technologies used to test waste and determine its parameters	national and EU legislation on testing and classifying waste, including its commercial properties			
		Classifying waste			the principles and criteria for classifying waste	**(GC) the legal regulations on classifying waste, taking into account ecodesign and the circular economy**			

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
I. Waste, materials, products	knows and understands...	**Segregating waste**		the principles of municipal waste segregation	the standards of waste segregation for individual types of materials recovery	the legal regulations on waste segregation; **(GC) advanced methods and technologies for waste segregation, taking into account environmental and energy efficiency**			
		Recovered raw materials and products made from waste	the basic groups of raw materials found in waste (e.g., glass, metal, plastics)	the types of products made from waste and resulting from waste management processes	the types of raw materials commonly found in waste and the combinations of their composition	the structure of the raw materials recovered from a given type of waste; **(GC) the principles of classifying and sending raw materials for further processing in the context of the circular economy**	the types of rare raw materials, including critical materials and the possibilities of their recovery through, e.g., urban mining, as well as their further utilisation	**(GC) potential waste containing new ingredients, valuable for sorting in terms of the circular economy, as well as waste of particular importance for environmental protection (hazardous and environmentally valuable)**	
		Potential use of waste			the uses of recovered materials and products made from waste	the possibilities for effectively using waste; **(GC) the possibilities of using the results of waste management processes (e.g., gases, energy, ash, slag, water)**	**(GC) the possibilities of utilising new types of waste, which have so far been subject to disposal, in recovery and recycling processes**	**(GC) the development trends in waste utilisation in order to minimise anthropogenic pressure and to reduce the use of primary raw materials**	**(GC) the latest achievements in the field of waste utilisation, effective recycling**
		Quality of recovered raw materials and products made from waste		the parameters characterising the recovered raw materials and products made from waste	**(GC) the factors influencing the qualitative parameters of the recovered raw materials and products made from waste in order to maximise recovery and recycling in the context of the circular economy**	the standards specifying the qualitative parameters of the recovered raw materials and products made from waste; the requirements of the qualitative parameters of the recovered raw materials and products made from waste; **(GC) legal standards as well as national and EU guidelines defining the quality standards in terms of ecodesign and the circular economy**			

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
I. Waste, materials, products	knows and understands...	**Principles of handling waste**	the procedures and instructions for handling municipal waste	the principles of handling specific types of non-hazardous waste, including the principles of packaging, market preparation and transport	**(GC) the principles of handling hazardous waste, including the rules for packaging, market preparation and transport preparation in order to reduce emissions**	the legal regulations on the methods of handling waste, including hazardous waste	the principles of handling unusual, rarely encountered, new types of waste, including waste from modern technologies		
		Chemical substances	the proper names, trade names and principles of labelling the chemical substances present in waste	the basic chemical substances contained in waste, including persistent organic pollutants	the properties of the chemical substances present in waste, including persistent organic pollutants, the norms and concentration limits of the chemical substances present in waste; **(GC) the potential health and environmental hazards resulting from contact with and the handling of chemical substances**	the chemical composition of waste; the combinations and interactions of the most common ingredients of chemical substances; **(GC) the impact of the chemical substances in waste on the properties of waste in terms of environmental protection and the recovery of valuable raw materials**	**(GC) the methods of preventing emissions from waste containing potentially harmful chemical substances**		
	is able to...	**Analysing waste and waste streams**	distinguish types of waste	organoleptically assess that the received waste is prepared correctly; recognise irregularities in the preparation and segregation of waste	classify waste intended for treatment; assess the compliance of waste with the declared code; understand and interpret the results of laboratory tests on waste	define the structure and qualitative parameters of the waste stream; **(GC) determine the suitability of waste for recycling and assess its potential environmental risks**	analyse the type, morphology and qualitative parameters of collected waste; **(GC) identify and classify environmentally hazardous waste**	**(GC) develop and implement activities to modify waste streams and improve the quality of collected waste in terms of the circular economy and reducing emissions;** **(GC) develop feedback for producers**	
		Assessing the potential for using waste			assess the suitability of a given type of waste or waste stream for treatment with a given method	identify potential uses of a given type of waste	**(GC) identify new possibilities for utilising waste, including preparing it for reuse and recycling**	**(GC) develop waste utilisation strategies using life cycle assessment (LCA) and energy optimisation**	**(GC) develop multi-variant strategic scenarios and directions of change in waste treatment and utilisation based on the principles of the circular economy and sustainable development**

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
I. Waste, materials, products	is able to…	**Determining the chemical composition of waste**		understand information on the chemical substances contained in waste provided by labels, safety data sheets and technical documentation	identify waste containing specific chemical substances (e.g., chlorine)	**(GC) identify the chemical substances contained in waste, taking into account potential emissions and the possibility of its optimal utilisation;** determine the concentration of chemical substances contained in waste	**(GC) assess the effect of the chemical substances contained in waste on the properties of waste as well as for potential emissions and threats to the environment**	search for optimal waste management technologies based on an analysis of their chemical composition	
II. Technology	knows and understands…	**Waste management**	the nomenclature relating to waste management	the concepts and terminology used in waste management processes; the types of processes conducted as part of waste management	the stages and course of waste management processes	the links between specific stages of waste management processes	**(GC) the mechanisms and criteria for optimising the course of waste management processes in the context of the circular economy;** **(GC) the methods of reducing emissions and increasing the energy efficiency of processes**	**(GC) the research conducted to increase the effectiveness of the waste management system and the circular economy, taking into account the minimisation of emissions and energy use**	the latest achievements in increasing the effectiveness of the waste management system
		Principles of operating machines and vehicles for waste collection and transport	the types of machines and vehicles used for waste collection and transport	the principles of the ongoing maintenance and operation of machines and vehicles for waste collection and transport, including the principles of placing, loading and unloading waste as well as securing waste during transport	**(GC) the principles of operating the machines and vehicles used for waste collection and transport, including the optimisation of fuel consumption and the minimisation of emissions**	**(GC) the construction and operation of machines and vehicles used for waste collection and transport, taking into account the aspects of environmental protection;** **(GC) the principles of analysing emissions into the environment from the means of transport**	the mechanisms and criteria for the technical and economic optimisation of operating machines and vehicles used for waste collection and transport	**(GC) the development trends of the machines, vehicles and other technologies used for waste collection and transport based on low- and zero-emission means of transport;** **(GC) the directions and trends of optimising transport with reduced anthropogenic pressure using AI**	the latest achievements in the machines, vehicles and other technologies used for waste collection and transport

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
II. Technology	knows and understands...	**Principles of operating installations and equipment for waste treatment processes**	the types of installations and equipment used in waste treatment processes	the principles of the ongoing operation and maintenance of installations and equipment used in waste treatment processes	the parameters, application and principles of operating installations and equipment used in waste treatment processes	the principles of operating and selecting/configuring/ programming installations and equipment used in waste treatment processes; **(GC) the principles of using digital technologies and AI to improve environmental and energy efficiency in waste treatment processes**	**(GC) the principles of designing installations used in waste treatment processes in terms of optimising efficiency and reducing energy consumption and emissions;** **(GC) the mechanisms and criteria for the technical and economic optimisation of operating installations and equipment used in waste treatment processes, taking into account the reduction of emissions and energy consumption**	**(GC) the development trends relating to the installations and equipment used in waste treatment processes, including solutions using the Internet of things (IoT), machine learning (ML), artificial intelligence (AI), virtual reality (VR), augmented reality (AR) and other innovative technologies, with a particular focus on energy efficiency and emissions reduction**	**(GC) the latest achievements relating to the installations and equipment used in waste treatment processes, including solutions using the Internet of things (IoT), machine learning (ML), artificial intelligence (AI), virtual reality (VR) , augmented reality (AR) and other innovative technologies, taking into account the latest trends relating to the environment and scientific research**
		Principles of operating tools and equipment used in disassembly	the types of tools and equipment used in disassembly	the principles of the ongoing operation and maintenance of tools and equipment used in disassembly	the parameters, application and principles of operating tools and equipment used in disassembly	the principles of operating and selecting tools and equipment used in disassembly			
		Disassembly process	the aims and principles of disassembling individual elements	the principles of prioritising individual elements in the disassembly process; the principles of handling disassembled parts, the principles of trading disassembled parts	the methods used in disassembly	the legal regulations on the methods and conditions of disassembly and the requirements for disassembly stations	**(GC) advanced waste disassembly methods based on intelligent technologies, including those maximising energy efficiency**	**(GC) the directions of development in disassembly methods, technologies and systems, including developments adapted to a varying waste stream and minimising emissions;** **(GC) the latest developments and trends in improving disassembly processes**	the latest achievements in disassembly technologies and systems used
		Storing waste	the internal regulations and company procedures for storing waste	the principles, conditions and limits for storing non-hazardous and inert waste	the principles, conditions and limits for storing inert and hazardous waste; **(GC) the methods of minimising emissions**	the legal regulations specifying the requirements for storing waste, including hazardous waste	the principles of optimising the use of space for storing waste	**(GC) the directions of development of storage and material handling technologies with the use of IT techniques and AI**	

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
II. Technology	knows and understands...	**Waste disposal**		the acceptance criteria, principles, conditions, limits and fees for the disposal of waste other than hazardous and inert waste	the acceptance criteria, principles, conditions, limits and fees for the disposal of inert and hazardous waste	the legal regulations specifying the requirements for waste disposal, including hazardous waste; **(GC) the reasons for and benefits of reducing the amounts of disposed waste**	**(GC) the principles of developing and optimising the use of space for waste disposal using modern technologies, such as GPS and AI, as well as emission monitoring tools**	**(GC) the directions of development in reducing waste disposal as part of other processes, including segregation;** **(GC) the directions of development in using landfill mining**	
		Information technologies		the principles of operating simple applications to report performed activities, including recording waste, delivery notifications and monitoring waste collection from the sites of its production	the IT tools supporting technical operations, including inspection documentation and repairs of installations and their elements; the methods of optimising the management of consumables and spare parts; the IT tools supporting the planning and organisation of activities in the processes of waste collection and transport	specialised applications to control processes, record process parameters and monitor emission levels in order to optimise operations; specialised applications to collect data in the cloud, enabling data analysis with the use of IT and AI technologies in order to optimise operations	the applications used in waste management processes based on such technologies as the Internet of things (IoT), machine learning (ML), artificial intelligence (AI), virtual reality (VR), augmented reality (AR) and other innovative technologies	the directions of development in the use of applications in waste management processes based on such technologies as the Internet of things (IoT), machine learning (ML), artificial intelligence (AI), virtual reality (VR), augmented reality (AR) and other innovative technologies	the latest achievements in the use of applications based on such technologies as the Internet of things (IoT), machine learning (ML), artificial intelligence (AI), virtual reality (VR), augmented reality (AR) and other innovative technologies
		Chemical processes		the types and course of chemical waste treatment processes; the parameters characterising chemical waste treatment processes	the types of chemical reactions occurring in waste treatment processes (e.g., incineration, landfilling)	the factors influencing the course of chemical reactions occurring in waste treatment processes; **(GC) the principles of selecting the parameters of the course of chemical processes in order to contain them and reduce emissions**	**(GC) the course of chemical reactions occurring in waste treatment processes and the impact of their load on the environment**	**(GC) the trends in using chemical waste treatment processes based on the circular economy and new technologies**	

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
II. Technology	knows and understands...	**Biological waste treatment**		the types and stages of biological waste treatment processes; the parameters characterising biological waste treatment processes	the types of biochemical reactions occurring in biological waste treatment processes (e.g., composting, fermentation)	the factors influencing the course of the biochemical reactions occurring in biological waste treatment processes; **(GC) the principles of selecting the parameters of the course of biological waste treatment processes in order to improve their efficiency and reduce emissions**	**(GC) the course of biochemical reactions occurring in biological waste treatment processes in order to reduce energy consumption and maximise energy production from renewable energy sources as well as to produce fertilizers and return elements to the environment**	**(GC) the trends in using biological waste treatment processes affecting energy optimisation and the minimisation of emissions**	
		Mechanical waste treatment		the types of operations and individual processes occurring in mechanical waste treatment; the parameters characterising the operations and individual processes occurring in mechanical waste treatment	the course and manner of implementing the operations and individual processes in mechanical waste treatment	**(GC) the factors affecting the course of operations and individual processes occurring in mechanical waste treatment in order to reduce emissions and energy consumption**	**(GC) the methods of observing and analysing mechanical waste treatment processes using IT tools**	**(GC) the methods of designing mechanical waste treatment processes to increase efficiency in terms of the circular economy, environmental and energy aspects**	**(GC) the latest methods and technologies based on research to achieve circular economy goals and to maximise the amount of waste prepared for recycling**
		Methods and technologies used in waste treatment processes		the types of methods and technologies used in waste treatment processes	the methods and technologies used in waste treatment processes; the methods and technologies relating to the production/recovery of energy from waste and processing the results of waste management processes (e.g., gases, energy, ashes, slag, water)	the criteria for selecting and applying waste treatment methods and technologies; **(GC) the requirements for waste treatment processes that produce raw materials and special-purpose products, e.g., those in contact with food or that can be reused**	waste treatment processes based on new technologies, high-efficiency and maximally selective methods; **(GC) the principles of designing waste treatment technologies (e.g., the sequence of operations and individual processes, parameters), including high-performance and maximally selective technologies, with the use of digital solutions**	**(GC) the directions of development in waste treatment methods and technologies taking into account economic changes, the achievement of a circular economy and sustainable development goals**	the latest waste treatment methods and technologies

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
II. Technology	is able to...	**Operating machines and devices**	operate manual and power tools used for performing simple professional tasks, including minor repairs, as well as activities to maintain and keep waste containers and bins clean	perform simple activities to operate the equipment used in waste management processes (preparation, start up, adjusting, setting parameters in accordance with instructions, shutting down, securing the machines/equipment after finishing work)	perform tasks to operate the machines, technological lines and assemblies of equipment used in waste management processes under predictable conditions (preparation, start up, adjusting, setting parameters in accordance with instructions, monitoring parameters, shutting down, maintaining and securing them after finishing work)	perform tasks to operate the machines, technological lines, equipment and their assemblies under variable and not fully predictable conditions (monitoring the operation, correcting parameters depending on the course of the process)	program computer-controlled machines, technological lines and equipment assemblies	**(GC) modify and optimise the software controlling the operation of machines, technological lines, equipment and their assemblies to meet energy efficiency requirements**	
		Operating vehicles	undertake activities to perform the ongoing maintenance of vehicles used to transport waste	perform activities to operate the vehicles used to transport waste (i.e., prepare for transport, mount waste containers and bins, operate the mechanisms, operate hook lifts, operate hydraulic truck cranes, provide ongoing operating maintenance)	**(GC) control and assess the technical condition of vehicles used to transport waste in order to reduce fuel consumption and emissions**	plan maintenance operations, including the procurement of spare parts and consumables, minimising stock levels using IT tools	**(GC) collect operational data in order to improve the maintenance and repair system, minimise stock levels and the consumption of fuels and consumables**		
		Operating and developing infrastructure	perform ongoing maintenance activities and the sanitary and fire prevention maintenance protocol of machinery and equipment	perform activities to maintain the technical condition of machinery and equipment (including ongoing maintenance and minor repairs); use the technical documentation of machinery and equipment	perform periodic technical inspections of machines, technological lines, equipment and their assemblies	plan operational activities, including the procurement of spare parts and consumables; **(GC) develop plans for inspections, repairs and the modernisation of machinery and equipment using IT tools and AI to reduce fuel and energy consumption**	**(GC) identify investment needs for machinery, equipment and infrastructure, taking into account the principles of sustainable development, reductions in energy consumption and emissions**	formulate conclusions and recommendations for the modification and modernisation of machines, equipment and technological lines and the development of infrastructure; **(GC) reduce infrastructure emissions while increasing efficiency in line with environmental trends, using LCA and carbon footprint analysis**	**(GC) design new solutions for the purpose of eliminating anthropogenic pressure with the use of IT tools**

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
II. Technology	is able to…	**Diagnosing malfunctions and irregularities**		recognise irregularities in the operation of machines, technological lines, equipment and their assemblies	diagnose malfunctions and irregularities in the operation of machines, technological lines, equipment and their assemblies	analyse the causes of occurring malfunctions and irregularities	eliminate the causes of occurring malfunctions and irregularities by modifying processes		
		Manually performing activities in waste management processes	perform activities in waste management processes in accordance with instructions or under supervision, e.g., move containers, sprinkle compost piles, turn over compost	perform activities in waste management processes under conditions requiring consideration of the specificity of waste, e.g., manually sort waste, unload waste, prepare waste for the technological process, package waste, perform residential waste collection activities					
		Using IT tools		enter, search for data, generate data sets using simple applications to report performed activities, record waste, monitor the waste collected from its production source	use IT tools to keep records of inspections, repairs and other activities relating to the technical operation of machines, equipment and technological lines as well as waste management documentation; use IT tools to plan and organise activities in waste collection and transport processes	perform tasks to operate specialised applications to control processes, record process parameters and monitor emission levels; **(GC) collect operational data in order to propose modifications and optimise activities, applying the principles of sustainable development, the circular economy and LCA analysis**	cooperate with software programmers in the development and implementation of software supporting waste management processes; **(GC) determine the IT tools in the application of LCA, carbon footprint and other environmental impact analyses**	perform tasks to operate applications used in waste management, based on such technologies as the Internet of things (IoT), machine learning (ML), artificial intelligence (AI), virtual reality (VR), augmented reality (AR) and other innovative technologies	

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
II. Technology	is able to...	**Selecting and monitoring waste storage conditions**		understand the conditions and limits of waste storage from the documentation	select storage conditions for non-hazardous waste; monitor the parameters of waste storage, monitor the state of stored waste	define the conditions for storing untypical waste as well as hazardous, medical and veterinary waste; **(GC) monitor and record emissions;** **(GC) reduce emissions by taking remedial action**	**(GC) apply technologies to monitor the environment around stored waste using unmanned aerial vehicles and online monitoring;** **(GC) apply technologies to monitor the quantities and types of stored waste**		
		Determining the conditions for waste disposal		understand the conditions and limits of waste disposal from the documentation	select the conditions for the disposal of typical waste, taking into account the type, amount and location of the disposal site	specify the conditions for the disposal of untypical waste, taking into account the type, size and location of the disposal site; **(GC) develop procedures and instructions for the disposal of waste in order to minimise emissions**	design the method of waste disposal; optimise the use of the disposal site area; **(GC) prepare the disposal area to be used for landfill mining and renaturation**		
		Selecting and monitoring the quantity and parameters of waste		understand the quantity, type and parameters of waste required in a given treatment process from the technological documentation	perform measurements, analytical tests and technological calculations on the quantity and qualitative parameters of waste for the needs of waste treatment processes	select the quantity, type and qualitative parameters of waste depending on the adopted aim of waste treatment as well as the requirements and technical capabilities of a given facility	**(GC) adapt the parameters of the waste monitoring system from available databases in terms of quantitative and qualitative characteristics, using online applications, transmission and ongoing data analysis in the cloud**		

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
II. Technology	is able to...	**Selecting and monitoring the parameters of technological processes**		understand the parameters of the technological processes of waste management from the documentation	monitor the parameters of waste management processes	select methods and technologies for waste treatment; select and modify the parameters of typical (mechanical) technological processes of waste management (e.g., sorting, mechanical recycling)	select and modify the parameters of variable (biological, chemical) technological processes of waste management (e.g., composting, thermal treatment, chemical recycling)	**(GC) modify waste treatment technologies depending on the parameters of the waste being treated in accordance with legal and environmental conditions and by implementing digital techniques for monitoring and analysing processes**	**(GC) develop innovative waste treatment technologies that reduce emissions, energy consumption as well as the consumption of materials and raw materials, using carbon footprint analysis and the principles of the circular economy**
		Supervising and assessing the course of waste management processes		sample, measure and record the parameters of waste management processes	monitor the course and assess the correctness of waste management processes	identify irregularities in waste management processes; **(GC) take preventive and corrective action, for example, by following the principles of BAT;** **(GC) collect data and then improve processes by eliminating irregularities and deviations, e.g., by following the principles of BAT**	analyse the causes and effects of irregularities in waste management processes	**(GC) develop new methods of supervising processes using information technology, minimising emissions, energy consumption and the occurrence of environmental risks**	
III. Safety	knows and understands...	**Risks associated with waste management technologies**		the risks of the applied technological processes occurring at one's work station and in the facility implementing waste management processes	the causes and types of risks to the safety of persons, property and the environment in waste management processes; the risks of fire and other hazards due to the presence of chemicals in waste, the risks of hazardous substance leaks	the impact of the occurrence of risks in waste management processes (e.g., fire, hazardous substance leaks, technological line stoppages) on the course of the technological process, the surroundings or the environment; **(GC) the principles of measuring and reporting risks relating to workplace safety and environmental protection**	**(GC) the long-term effects of the risks in waste management processes on the surroundings or the environment, taking into account economic costs, environmental remediation and reclamation**	**(GC) the methods of developing scenarios for addressing the occurrence of particular hazards**	

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
III. Safety	knows and understands...	**Risks of having contact with waste**		the risks resulting from contact with waste (e.g., poisoning, puncture wounds, contamination)	the direct effects on health or life resulting from contact with hazardous waste	the long-term effects on health or life resulting from having contact with hazardous waste	**(GC) the methods of analysing the risks resulting from contact with waste and protecting against them**	**(GC) the trends presented in national and EU documents on green technologies for counteracting the risks of exposure to waste**	
		Risk management procedures and assessment		**(GC) the procedures to be followed in cases of contact with waste posing a threat to health, life, property or the environment**	the agents posing a threat, including pathogens and fire hazards (e.g., sources of fire, agents causing spontaneous combustion) in waste treatment processes	the methodology for risk assessment in waste management processes; the technologies supporting risk assessment	innovative technologies supporting risk assessment, including the use of artificial intelligence (AI)		
		Safety measures	the safety measures to be taken during the performance of professional tasks, including operating procedures, personal protective equipment, vaccination	how to secure vehicles, machinery and equipment to prevent situations causing risks to health, life, property or the environment	**(GC) how to secure vehicles, machinery and equipment in the event of breakdowns or disruptions in work causing risks to health, life, property or the environment**	the safety instrumented systems (SIS) of waste management processes	the safety measures for treating waste that is particularly hazardous, new, having unknown or nonstandard properties	the directions of development in the field of applied methods, technologies and systems ensuring safety in waste management processes	the latest achievements in the use of methods, technologies and systems ensuring safety in waste management processes
		Principles of applying safety measures		the principles and procedures of applying measures to ensure safety during the performance of professional tasks and reducing risks	the principles of selecting measures to reduce the risk of hazards and emergencies	the principles for designing measures to reduce the risk of hazards and emergencies			
III. Safety	is able to...	**Assessing the risks posed by waste**	**(GC) identify waste posing a risk to health, life, property or the environment based on their physical characteristics**	**(GC) identify waste containing chemicals posing a risk to health, life, property or the environment**	assess the risk of hazards occurring that are caused by waste	analyse the causes and effects of hazards resulting from various types of waste	**(GC) assess the scale of the risk posed by waste**	**(GC) predict the risks of environmental contamination**	**(GC) produce models of the risk of environmental contamination**
		Handling waste that poses risks	**(GC) implement procedures and instructions for handling identified, typical waste that may pose a risk to health, life, property or the environment**	**(GC) implement procedures and instructions for handling detected, untypical waste that may pose a risk to health, life, property or the environment**	secure hazardous, medical, veterinary and radioactive waste in accordance with procedures	neutralise waste, including hazardous, medical and veterinary waste	**(GC) implement and adapt new techniques, e.g., BAT, to prevent waste from having a potential impact on the environment**		

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
III. Safety	is able to…	**Developing procedures and instructions for handling waste**			**(GC) develop instructions and catalogues to facilitate the identification of wastes posing a risk to health, life, property or the environment**	**(GC) develop procedures and instructions to ensure safety during the occurrence of threats involving waste posing a risk to health, life, property or the environment** **(GC) develop procedures and instructions for handling waste using, e.g., BAT techniques**			
		Implementing and developing safety procedures	implement procedures to ensure safety during the performance of professional tasks in the workplace	implement procedures and operating instructions in emergency situations, including those posing a risk of environmental contamination, to health and life (e.g., puncture wounds, abrasions, contact with pathogens)	develop procedures and instructions to ensure safety during the performance of professional tasks at the work station	develop procedures and instructions to ensure safety during emergencies	**(GC) develop plans in the event of a threat to health, life, property or the environment**		
		Applying safety measures	use personal protective equipment to ensure safety during the performance of professional tasks	select personal protective equipment to ensure safety during the performance of professional tasks	supervise the use of safety measures during the performance of professional tasks, including personal protective equipment	choose solutions to ensure the safety of the waste management processes being conducted	adapt and implement solutions to improve safety in waste management processes	**(GC) analyse the effectiveness and improve solutions to increase safety in waste management processes, e.g., using BAT techniques**	**(GC) develop new solutions to improve safety in waste management processes, e.g., using BAT techniques**
		Providing job induction and safety instruction		provide information on safety in waste management processes, including safety in the facility implementing waste management processes	provide instruction on occupational safety and on the recognition and handling of waste that may pose a threat to health, life, property or the environment	provide job induction for newly hired employees on waste management processes	**(GC) conduct training and verify competences relating to the implementation of activities ensuring the safety of employees, bystanders, property and the environment as well as cybersecurity**	**(GC) develop a strategic plan to train and improve the qualifications of employees, especially in the area of safety and the implementation of modern environmental protection techniques**	

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
IV. Entities and the market	knows and understands...	**Entities involved in waste management**	the types of entities involved in waste management and the scope of the services they provide	the principles of cooperation among entities implementing waste management processes	the needs and expectations of waste management entities; the structure of waste management entities in a given area	the models and good practices of cooperation among waste management entities, including within the framework of industrial symbiosis	the mechanisms shaping the needs and expectations of waste management entities	**(GC) the development trends relating to the needs of waste management entities in the area of green and low-emission technologies**	
		The market of raw materials and products made from waste			the prices and data on the supply and demand for raw materials and products made from waste	the determinants of the domestic and global markets for recovered raw materials and recycled products from waste (customer groups, export opportunities, competition, prices)	the mechanisms shaping the conditions of the domestic and global markets for recovered raw materials and recycled products from waste (customer groups, export opportunities, competition, prices)	**(GC) the development trends in the domestic and global markets for recovered raw materials and recycled products from waste**	
		Recipients of raw materials and products made from waste	the types of entities that are the recipients of raw materials and products made from waste	the principles of cooperation with the recipients of raw materials and products made from waste	the needs and expectations of the recipients of raw materials and products made from waste	the socio-economic factors shaping the needs and expectations of the recipients of raw materials and products made from waste	the mechanisms shaping the needs and expectations of the recipients of raw materials and products made from waste	the development trends relating to the needs of entities receiving raw materials and products made from waste	
		Social aspects of waste production	the types of entities that produce waste	the principles of conduct and good practices influencing the reduction of waste production	the social phenomena influencing waste production (e.g., movements and ideas promoting environmental protection, consumer trends)	**(GC) the socio-economic determinants influencing the formation of environmental protection attitudes in society and increasing awareness of responsible waste management**	the mechanisms shaping the consumer choices of society influencing waste production	the forecasts of the social and economic effects on waste production, resulting from the implementation of mechanisms shaping society's consumer choices	
		Responsibility for placing products on the market		**(GC) the principles of applying extended producer responsibility**	the fees and obligations incumbent on entities placing products on the market relating to waste management	the legal regulations on the responsibility of producers for products placed on the market, among others, resulting from the extended producer responsibility system	**(GC) ecodesign methods of making products and packaging in order to achieve the circular economy**		

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
IV. Entities and the market	knows and understands...	**Waste production and acquisition**		the sources of waste acquisition	the principles and costs of acquiring various types of waste, the principles of cooperating with waste producers; data on producing and acquiring a specific type of waste, e.g., critical raw materials	the socio-economic factors influencing the production and possible acquisition of a specific type of waste, e.g., critical raw materials	the market mechanisms influencing the production and acquisition of various types of waste	the forecasts and market trends in waste production and acquisition	
		Principles of customer service		the principles of individual and institutional customer service	the good practices of customer service and building relationships with individual and institutional clients; **(GC) the methods of conveying information to the customer to increase environmental awareness so that waste is handled correctly**	the principles of conduct with customers in difficult and conflict situations; **(GC) the methods of developing public information messages aimed at building environmental awareness**			
	is able to...	**Researching the needs of entities involved in waste management**			identify the needs of waste recipients, waste processors, recipients of recovered raw materials and products made from waste in terms of the quantity, type and qualitative parameters of delivered waste and recovered raw materials	analyse the factors influencing the demand of waste recipients, waste processors, recipients of recovered raw materials and products made from waste in terms of the quantity, type and qualitative parameters of delivered waste and recovered raw materials	diagnose the needs of waste recipients, waste processors, recipients of recovered raw materials and products made from waste in terms of the quantity, type and qualitative parameters of delivered waste and recovered raw materials	**(GC) forecast market trends in the waste management sector based on legal and market changes as well as national and EU environmental strategies**	
		Negotiating the terms of cooperation			establish the principles of cooperation in waste management processes	determine the terms of transactions in waste management, including setting prices and the terms of cooperation	negotiate short and long-term delivery terms, prices, terms of cooperation with suppliers and recipients of waste and recovered raw materials	develop sales strategies based on market changes in the supply, demand and prices of recovered raw materials, products and waste	

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
IV. Entities and the market	is able to…	**Cooperation with customers and cooperants**			develop specifications for deliveries and services relating to waste management	prepare the documentation for cooperation with customers or cooperants, e.g., contracts, offers, orders	secure new customers and cooperants; **(GC) establish and maintain relationships with customers, cooperants, including through industrial symbiosis and cooperation with other sectors of the economy, optimising transactions from a circular economy and carbon footprint analysis perspective**		
		Handling conflict situations			perform tasks relating to complaints about improper qualitative parameters or irregularities in the structure of waste or method of its preparation	resolve disputes relating to waste management, e.g., resulting from improper qualitative parameters or irregularities in the structure of waste or method of its preparation	mediate the resolution of conflicts relating to waste management that involve the local community	**(GC) work out a social compromise to minimise emissions in a situation of potential risk to health and the environment** **(GC) develop a strategy of cooperation with stakeholders**	
		Monitoring and shaping waste management policies			monitor changes in permits, approvals and other administrative decisions influencing the waste management processes conducted by a given entity; analyse the activities conducted in the context of compliance with the law on waste management as well as the permits, approvals and other administrative decisions held by a given entity	monitor changes in the legal regulations governing waste management; manage the circulation of information on legal regulations, including developing and providing colleagues and contractors with information on changes in legal regulations and monitoring their implementation	**(GC) analyse the effects of legislative changes in waste management policies**	develop recommendations for legislative changes relating to waste management	**(GC) formulate guidelines for changes in national and international strategies and policies relating to the circular economy and to reduce anthropogenic pressure in waste management**

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
IV. Entities and the market	is able to...	**Supporting measures for conscientious waste management**		provide information on the possibility of transferring waste for processing and its preparation	explain the principles of transferring waste for processing and the methods of its preparation for processing (e.g., guidelines for sorting waste in the municipality)	develop information and communications, including marketing and media messages, on the principles of waste management, to raise awareness about waste management and to promote the directions of change proposed in the country and EU	conduct marketing and media activities to raise awareness about waste management, including building a positive image of the sector; **(GC) develop and promote solutions supporting the circular economy by popularising the concepts of less waste and zero waste, e.g., solutions facilitating the exchange of objects, reuse, extending the life and usefulness of a product**	**(GC) develop strategies to minimise waste production and to handle waste in accordance with the principles of the circular economy and environmental protection**	
		Educating in the field of responsible waste management				formulate information and messages, including those addressed to the local community, decision-makers, representatives of entities implementing waste management processes and business partners, about the ways of implementing waste management processes in a given locality	**(GC) conduct training, information and educational activities about responsible waste management, e.g., develop nature trails, organise open visiting days**	**(GC) implement educational and training programmes to increase awareness about waste management;** **(GC) develop strategies and objectives for communication messages aimed at implementing the principles of national and EU environmental policies**	**(GC) develop and implement educational and training programmes to raise awareness about waste management, which include legal regulations, strategies and reports, among others from IEP-NRI, EEA and other national and EU agencies**

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
V. Environment (surroundings)	knows and understands...	**The impact of waste management on the environment**		how waste management affects the environment	the parameters characterising the impact of waste management on the environment	the limits and thresholds of the impact of waste management on the environment; **(GC) the methods of testing the level of the impact of waste management on the environment, including methods for calculating the product environmental footprint (PEF), carbon footprint, life cycle assessment (LCA)**	**(GC) the impact of waste management on the environment** **(GC) the methods of minimising the impact of waste management on the environment and to compensate for undesirable effects, based, among others, on BAT techniques**		
		The circular economy		**(GC) the concepts relating to the circular economy, waste treatment hierarchy, product life cycle assessment (LCA)**	**(GC) the assumptions and principles of the circular economy**	**(GC) the impact of waste management on the use of natural resources, including the resources of primary and recycled raw materials;** **(GC) the policies and strategic documents implemented by national and EU institutions (IEP-NRI, EEA and others)**	**(GC) the determinants for and benefits of implementing the circular economy in terms of materials and energy, based on national and EU policies and strategies**	**(GC) the directions of development of the circular economy based on national and EU legal acts, strategies and publications**	
		Emission of hazardous, harmful and nuisance agents		the types and sources of emissions of hazardous, harmful or nuisance agents and other environmental hazards occurring in waste management processes	the amount of emissions of hazardous, harmful or nuisance agents in waste management processes	the conditions influencing the amount of emissions of hazardous, harmful or nuisance agents and the occurrence of other risks to the environment in waste management processes	**(GC) the long-term effects of harmful and nuisance factors released to the environment in waste management processes;** **(GC) the methods of measuring, reducing and eliminating emissions based on, among others, BAT techniques**		

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
V. Environment (surroundings)	knows and understands...	**Reducing negative impacts**		**(GC) the principles and operating procedures during the performance of professional tasks for reducing the negative impact on the environment**	**(GC) the methods and operating procedures for changing the emission parameters of waste management processes**	**(GC) the methods of reducing the negative impact of waste management processes on the environment**	**(GC) the methods and organisational solutions reducing the impact of the waste management sector on the environment based on LCA and carbon footprint analyses**	**(GC) the directions of development in the field of technologies reducing the negative impact of waste management processes on the environment**	**(GC) the latest technologies reducing the impact of waste management processes on the environment in accordance with national and EU legal requirements and strategies**
		Legal regulations		the content of administrative decisions on the emission parameters for a given installation	the obligations, fees and penalties relating to the impact of waste management processes on the environment	**(GC) the legal regulations defining environmental protection requirements and the impact of waste production and waste management processes on the environment;** **(GC) the principles and methods of changing legal regulations to minimise the anthropogenic pressure of waste management**	the current determinants of national, European and global environmental policies on waste production and waste management processes	the directions of change in national, European and global environmental policies on waste management	
		Improper handling of waste		the sanctions for illegal or improper waste management	the illegal and improper ways of handling waste that negatively impact the environment (e.g., illegal dumping, household trash incineration)	**(GC) the risks to the environment of illegally or improperly handling waste**	**(GC) the organisational methods and solutions for reducing the illegal or improper ways of handling waste as well as minimising their impact on the environment**		

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
V. Environment (surroundings)	is able to...	**Testing environmental impact**		obtain and collect data necessary for studying and analysing environmental impact	measure emission amounts and the impact on the environment of hazardous, harmful and nuisance factors occurring in waste management processes	**(GC) test the environmental nuisance level of waste management processes;** **(GC) test the product environmental footprint (PEF), including the carbon footprint, conduct a life cycle assessment (LCA)**	**(GC) analyse and assess the impact of waste management processes on the environment;** **(GC) assess the risk to the environment of the impact of waste management processes**	**(GC) forecast the long-term impact of waste management processes on the environment**	**(GC) plan and implement research activities and strategies to minimise the impact of waste management on the environment**
		Reducing the handling of waste that negatively impacts the environment		**(GC) implement procedures and instructions to reduce negative impacts on the environment**	**(GC) implement activities, projects and programmes to reduce the handling of waste that negatively impacts the environment**	**(GC) select methods and organisational solutions to reduce the handling of waste that negatively impacts the environment**	**(GC) design activities and organisational solutions to reduce the handling of waste that negatively impacts the environment**	**(GC) conduct activities to introduce legislative changes reducing the handling of waste that negatively impacts the environment**	
		Implementing technologies that reduce the impact of waste management processes on the environment			**(GC) perform environmental inspections;** **(GC) detect and diagnose the causes of the negative impact of waste management processes on the environment**	**(GC) promote pro-environmental protection attitudes based on existing national and EU legal regulations and strategies**	**(GC) adapt and implement technologies and organisational solutions that minimise the negative impact of waste management processes on the environment**	**(GC) modify waste treatment technologies to minimise the impact of waste management processes on the environment based, among others, on BAT techniques**	**(GC) develop new technological solutions that minimise the negative impact of waste management processes on the environment**
		Preparing environmental documentation		obtain and collect the data needed to conduct environmental reporting	process and compile data, including environmental impact assessment data, required for permits, approvals and other administrative decisions, as well as data relating to environmental reporting	develop the documentation required to obtain permits, approvals and other administrative decisions as well as the documentation relating to environmental reporting	**(GC) analyse environmental reports and draw conclusions about environmental impact based on the obtained results**		

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
VI. Organising the processes implemented in the sector	knows and understands...	**Effectiveness of waste management – principles**		good waste management practices in households	**(GC) good waste management practices in businesses;** **(GC) good ecodesign practices**	**(GC) good practices and organisational solutions increasing the effectiveness of waste management on the scale of one or more municipalities acting jointly to implement waste management activities**	**(GC) good practices and organisational solutions that increase the effectiveness of waste management on a national scale, taking into account LCA analyses and the principles of a circular economy**	**(GC) good practices and organisational solutions that increase the effectiveness of waste management on an international scale**	
		Effectiveness of waste management – benefits			**(GC) the benefits of effective waste management in accordance with the principles of sustainable development**	**(GC) the impact on the environment of applying solutions and technologies that increase the effectiveness of waste management, taking into account the minimisation of emissions, energy consumption and the maximisation of recycling;** **(GC) the methods and principles for acquiring knowledge and developing strategic courses of action in accordance with the principles of a circular economy and sustainable development**	**(GC) the long-term results of introducing and applying solutions and technologies that increase the effectiveness of waste management based on national and EU environmental protection policies and strategies**		
		Principles and determinants of waste collection	waste collection methods; the types and capacity of bins and containers used for waste collection; the procedures and instructions for waste collection, including what to do if the waste is not properly prepared for collection	the principles of situating and maintaining waste collection sites; the principles of operating selective collection points for municipal waste; the principles of collecting specific types of waste (e.g., large bulk, medical, hazardous)	local determinants and waste management systems; the principles of responsibility relating to waste collection (e.g., principles of the responsibility for loading)	the legal regulations on waste collection, including those on maintaining cleanliness and order in municipalities	**(GC) the principles of optimising waste collection systems aimed at maximising recycling and minimising the impact of the waste management system on the environment**		

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
VI. Organising the processes implemented in the sector	knows and understands...	**Determinants of waste transport**	data on the tonnage and payload of waste transport vehicles	the sources of data on the topography of the area, the organisation of traffic in a given area, restrictions on the movement of certain types of vehicles	the principles, local conditions and restrictions (e.g., road capacity, congestion) relating to the movement of waste transport vehicles on roads	the legal regulations, including local regulations, on the movement of waste transport vehicles	the principles of optimising the waste collection system using IT technologies, including AI, aimed at minimising fuel consumption and maximising the efficiency of the system	**(GC) the principles of developing innovative solutions in waste transport maintaining zero emissions and utilising international experience**	
		Principles of waste transport		the procedures for transporting non-hazardous waste, including the rules for marking vehicles; **(GC) the principles of planning and securing transport against emissions and situations posing environmental hazards**	the procedures for transporting hazardous waste, including the rules for marking vehicles; **(GC) the principles of planning and securing transport against emissions and situations posing environmental hazards**	the legal regulations on waste transport and specifying the requirements for machines and vehicles used for waste transport; the legal regulations on the transboundary movement of waste			
		Principles of conducting activities in the sector		the authorisations required to perform and supervise professional tasks in waste management processes	the principles of conducting waste management activities, including procedures for receiving waste, treating waste, operating disposal areas, waste incinerators and other waste treatment facilities	the legal regulations on conducting waste management activities, including those defining criteria, procedures, obligations and fees; **(GC) the benefits of using green technologies in conducting activities**	the mechanisms supporting activities in the waste management sector, e.g., subsidies, funds, abatements	**(GC) the policies and directions of change in the economy influencing the conditions for conducting business in the waste management sector based on national and EU policies and strategies, e.g., Fit for 55, the European Green Deal and others**	
		Principles of preparing and maintaining documentation			the principles of keeping records and reporting, operating the Database on products and packaging and on waste management (BDO) as well as other databases maintained for the needs of waste management processes	the legal regulations on keeping records and reporting	the principles of collecting data in digital form for subsequent analysis and process optimisation		

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
VI. Organising the processes implemented in the sector	knows and understands...	**Principles of obtaining permits, approvals and other administrative decisions**			the procedures for obtaining permits, approvals and other administrative decisions relating to waste management	the legal regulations on obtaining permits, approvals and other administrative decisions relating to waste management	the principles of planning new investments and the preparation necessary for permits and authorisations based on legal changes		
	is able to...	**Organising work**			organise the work of teams, conduct activities increasing the effectiveness of the activities of teams performing monotonous work; adapt the task execution plan to ensure maximum motivation and effectiveness of the work of teams performing tasks in waste management processes	perform employee induction, organise and supervise the work of persons with special needs, e.g., persons with disabilities, prisoners; adapt the work plan to the specific requirements of persons performing tasks in waste management processes	organise the work of teams under changing conditions resulting from the diversity and variability of waste streams; revise the team's action plan in response to changing conditions resulting from the diversity and variability of waste streams	develop and implement organisational solutions increasing the effectiveness of the activities of teams, including those performing monotonous work or working under variable and unpredictable conditions; **(GC) acquire and implement methods of obtaining and applying knowledge in the field of waste collection from countries and regions with more experience in this field**	**(GC) develop a training system to improve the organisation of work and increase its efficiency in order to attain green competences, among other things**

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
VI. Organising the processes implemented in the sector	is able to...	**Ensuring business continuity in waste management processes**		conduct activities resulting from procedures ensuring business continuity in waste management processes	implement business continuity plans in situations of planned inspections, repairs, maintenance, equipment and facility modernisation as well as planned changes in the structure and quantity of the waste	implement business continuity plans in emergencies, situations of unplanned changes in the structure and quantity of the waste and other emergency situations causing disruptions in the waste management process (e.g., an accident at work, biological contamination)	supervise the implementation of business continuity plans, including in emergencies, situations of unplanned changes in the structure and quantity of waste, and when other disruptions occur in the waste management process, and also counteract such situations; **(GC) collect historical data and analyse them using digital technologies to eliminate points of potential risk (including environmental risks) in the continuity of the processes being conducted**	**(GC) forecast and design changes in waste treatment processes based on trends, research, innovation, technology and computational models**	
		Preparing instructions and plans			develop instructions and operating procedures to handle situations of downtime and business continuity disruptions resulting from planned inspections, repairs, maintenance, equipment and facility modernisation as well as planned changes in the quantity and structure of waste	develop business continuity plans in situations of planned inspections, repairs, maintenance, equipment and facility modernisation and in situations of planned changes in the quantity and structure of waste	develop plans for handling emergency situations, unplanned changes in the quantity and structure of waste and other emergencies disrupting the waste management process (e.g., accidents at work, biological contamination)	**(GC) develop business continuity plans and strategies, taking into account the risk of emergencies, unplanned changes in the quantity and structure of waste and other disruptions in the waste management process, keeping in mind the aims of a circular economy and the minimisation of energy consumption and emissions**	

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
VI. Organising the processes implemented in the sector	is able to...	**Planning the collection, receipt and transport of waste**			organise one-time activities relating to the collection, receipt, shipment or transport of waste, including the planning of dates, resources, routes and selecting the means of transport	plan and optimise permanent/cyclical activities relating to the collection, receipt, shipment or transport of waste, including the planning of dates, resources, routes, selecting the means of transport, scheduling waste collections	plan and optimise activities relating to the collection, receipt, shipment or transport of waste, plan dates, resources, routes in unusual situations, e.g., resulting from local and seasonal specificities, traffic problems, changes in the quantity and structure of waste	**(GC) develop new collection systems to optimise waste collection, receipt and transport in order to minimise energy consumption and environmental impact, using IT tools;** **(GC) develop new collection systems with the use of zero-emission vehicles, autonomous and IoT-compatible smart containers**	
		Analysing effectiveness		identify the factors influencing the effectiveness of waste management processes	analyse the parameters influencing the effectiveness of waste management processes	analyse the effectiveness of waste management processes	establish the criteria for optimising waste management effectiveness, including economic and environmental criteria; analyse the effectiveness of waste management on the scale of a municipality or an inter-municipal association, region or country	forecast the effectiveness of waste management processes, taking into account the scenarios of technological and organisational development in the waste management sector	**(GC) produce development strategies to increase the effectiveness of regional and national waste management enabling the implementation of circular economy goals**
		Preparing and maintaining documentation	complete documentation on waste collection and receipt, follow procedures to document the receipt of waste	understand data on waste and enter it into the Database on products and packaging and on waste management (BDO) as well as other databases maintained for the needs of waste management processes; **(GC) collect data to calculate the level of readiness for reuse and recycling**	maintain documentation on waste management, including records and reports in the Database on products and packaging and on waste management (BDO); control the correctness of waste management documentation	prepare the documentation for obtaining permits, approvals and other administrative decisions relating to waste management and the registration of waste management activities	obtain financing from external funding sources (national funds for environmental protection, Norway Grants and other funds) for implementing investments in waste management processes		

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
VII. Communication	is ready to...	**Communicating with waste producers (residents, entrepreneurs) and external entities**			communicate with residents and business owners about the waste they produce, adapt the form and content of the message to the recipient	maintain relations with external entities, including subcontractors, research units, media and public services (e.g., police, fire brigade, sanitary and epidemiological inspectorates)	implement activities that build a positive image of the waste management sector and its entities among customers, contractors, employees, residents and learners	**(GC) promote positive attitudes towards environmental protection based on existing laws as well as national and EU strategies and policies**	
		Communicating with representatives of waste management entities			communicate with suppliers, recipients and other entities performing activities in waste management processes	maintain relations with suppliers, recipients and other entities performing activities in waste management processes	maintain relations with organisations associating individuals and entities operating in and for the waste management sector	establish and shape conditions for cooperation among persons and entities operating in and on behalf of the waste management sector, including establishing and developing cooperation within the framework of industrial symbiosis	establish and shape conditions for cooperation with international organisations and entities acting on behalf of the waste management sector, including establishing and developing cooperation, e.g., within the framework of industrial symbiosis
		Communicating with local government representatives and legislators			communicate about waste management with representatives of local authorities in a given area (e.g., a municipality, inter-municipal association, region)	maintain relations with representatives of local authorities in a given area (e.g., a municipality, inter-municipal association, region) in connection with waste management	establish and maintain relations with legislative representatives in connection with actions to improve waste management effectiveness	**(GC) develop and shape the conditions for cooperation to implement solutions and legislative changes to improve waste management effectiveness in accordance with the circular economy and environmental protection**	**(GC) develop and shape the conditions for establishing international cooperation to implement solutions and legislative changes to improve waste management effectiveness based on national and foreign policies and strategies**

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
VIII. Promoting attitudes of environmental protection	is ready to...	**Promoting attitudes among producers**				**(GC) promote the principles of responsible design to increase the effectiveness of the circular economy, e.g., ecodesign, ensuring the possibility of recycling packaging, reducing the amount of produced waste**	**(GC) promote positive attitudes towards environmental protection relating to ecodesign and reducing the waste generated by producers**	**(GC) undertake activities encouraging manufacturers to implement ecodesign principles and the premises of the circular economy using LCA and carbon footprint analyses**	**(GC) develop and promote best practices in ecodesign and in implementing the premises of the circular economy using LCA and carbon footprint analyses**
		Shaping awareness about waste management			inform about the principles of the proper segregation and treatment of waste produced in households and companies	promote the principles of the proper segregation and treatment of waste produced by households and companies	**(GC) promote positive attitudes towards environmental protection relating to proper waste management by residents, company owners and representatives of local authorities**	**(GC) undertake activities to increase awareness about waste management among residents, company owners and representatives of local authorities in accordance with the principles of the circular economy**	**(GC) shape the attitudes of residents, company owners and representatives of local authorities on conscientious waste management in accordance with the principles of the circular economy**
		Shaping attitudes aimed at reducing waste production by residents			**(GC) apply the principles of reducing waste production, e.g., in accordance with the concept of less waste**	**(GC) promote the principles of reducing waste production, e.g., in accordance with the concept of less waste**	**(GC) promote the attitudes and concepts of reducing waste production, including the concepts of less waste and zero waste;** **(GC) promote behaviours aimed at minimising waste production using modern technologies aimed at its reuse as part of the circular economy system**	**(GC) undertake activities to popularise the concepts of reducing waste production, including the concepts of less waste and zero waste**	**(GC) shape the conditions conducive to reducing waste production**
IX. Responsibility		**Safety**	act in accordance with instructions and regulations on work safety in a given job position	comply with safety principles and regulations	ensure one's own safety and that of co-workers and bystanders	take into account the risk of situations occurring that threaten the safety of persons and property during the implementation and planning of activities in waste management processes	undertake activities to increase safety in waste management processes	promote solutions to increase safety in waste management processes	

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
IX. Responsibility	is ready to...	**The environment**	act in accordance with instructions and regulations on environmental protection	comply with the principles and regulations on environmental protection in waste management processes	**(GC) perform professional tasks, taking into account their impact on the environment and taking care to protect the environment**	**(GC) undertake activities to reduce the negative impact of waste management on the environment**	**(GC) promote solutions aimed at reducing the negative impact of waste management on the environment**	**(GC) propose the implementation of new behaviours and technologies that reduce human impact on the environment in the field of waste management**	
		Openness to change			adapt to changes in the work environment relating to fluctuations in the organisation of work as well as the types and morphology of treated waste	be open to changes in the work environment and industry relating to the implementation of new technical and organisational solutions in waste management	**(GC) develop an atmosphere of flexible management in a changing economic environment in order to optimise processes on an ongoing basis, minimising their carbon footprint;** **(GC) develop market changes in the field of waste management on the basis of national and EU environmental strategies and policies**		
		Reliability		take into account the impact of the reliability and accuracy of one's own work on the waste management process	take into account the impact of one's own activities and decisions as well as those of a subordinate team on the effectiveness of the waste management process	take into account the social and economic benefits of reliably and accurately implementing waste management processes	undertake activities to promote the standards and principles of reliability and accuracy in performing tasks in waste management processes	promote the principles of maintaining high reliability and accuracy in performing tasks in waste management processes	shape the standards and principles of maintaining high reliability and accuracy in performing tasks in waste management processes
		Responsibility for property		implement activities, taking into account their impact on property and the course of the professional tasks being performed	take responsibility for entrusted property and the proper course of the professional tasks being performed	take responsibility for planning and supervising the activities conducted by teams in waste management processes, including those ensuring business continuity in waste treatment processes	make decisions under time pressure and in difficult situations relating to the occurrence of disruptions in waste management processes		

SECTORAL DETERMINANT		COMPETENCE SERIES	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8
IX. Responsibility	is ready to...	**Responsibility for safety**		take into account the impact of performed activities on one's own safety and that of one's co-workers	take responsibility for one's own safety and that of one's co-workers	take responsibility for planning and supervising the activities conducted by teams in waste management processes, including those ensuring the safety of people, property and the environment	make decisions under time pressure and in difficult situations relating to the occurrence of disruptions in waste management processes and accidents threatening the safety of people, property and the environment	make decisions in high-risk situations relating to an immediate threat to human life and health or the possibility of environmental contamination	
		Acting independently		act and make decisions partially independently on the manner of performing professional tasks relating to the collection, assessment, classification and treatment of waste	perform professional tasks in waste treatment processes under variable conditions, time pressure and in situations of possible contact with waste posing a risk to people, property or the environment	perform professional tasks in waste treatment processes in situations posing a specific risk to people, property or the environment	**(GC) act and decide independently in non-routine situations posing an environmental risk, based on collected knowledge and competence**		

5. Glossary of terms used in the updated Sectoral Qualifications Framework for Waste Management

Term	Definition
Anthropopression	Direct or indirect human impact causing intentional or unintentional changes in the environment.
Artificial intelligence (AI)	Activities based on knowledge modelling, data and the development of algorithm systems and computing power, which, given the current state of technology, allow for the creation of relatively automated methods to acquire, process and analyse data. This enables the system to improve itself autonomously or predict behaviours and actions based on the analysis of the collected data and correlations between them, with the ability to influence the external environment and interact with it using sensors and actuators. These interactions can occur mechanically or with human involvement in the life cycle of artificial intelligence, from the stage of creation, development, implementation and use, to the stage of the decision to decommission and dispose of the system.
Augmented reality (AR)	A system that combines the real world with a computer-generated one. It typically uses a camera image overlaid with real-time 3D graphics. There are also applications that support only audio.
Best available techniques (BAT)	The most effective and advanced level of technology and methods for conducting a given activity. BATs are used as a basis for setting limit values aimed at preventing emissions or, where this is not practicable, reducing emissions and their impact on the environment as a whole. They were introduced by Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing the best available techniques (BAT) conclusions for waste treatment.

Carbon footprint	The total sum of greenhouse gas emissions caused directly or indirectly by a person, organisation, event or product. It is a calculation of the total greenhouse gas emissions during the entire life cycle of a product. The carbon footprint is expressed as the carbon dioxide equivalent per functional unit of the product (CO_2e/functional unit).
Circular economy	The circular economy, or closed loop economy, is a business model that minimises the consumption of raw materials and the generation of waste. Its aim is to extend the life cycle of products, slow down the use of natural resources, reduce greenhouse gas emissions and lower energy consumption.
Critical raw materials	Raw materials of high economic importance to the EU, the supply of which may be disrupted due to the concentration of their sources and lack of affordable substitutes.
Eco-design	Taking environmental aspects into account in product design in order to improve the environmental performance of a product throughout its life cycle.
Emission	The direct or indirect introduction into the air, water, soil or land of: a) substances, b) energy, such as heat, noise, vibration or electromagnetic fields, as a result of human activity.
European Environment Agency (EEA)	See the European Environment Agency at https://www.eea.europa.eu/en
European Environmental Bureau (EEB)	A non-governmental organization comprising a network of civil society organisations involved in environmental protection in Europe – www.eeb.org
Green competences	The scope of knowledge, skills and attitudes necessary to implement a green and just transition of the economy in line with the concept of sustainable development. Their aim is to reduce greenhouse gas emissions, mitigate climate change and adapt to its effects.

Green transition	The process of transitioning from traditional economic models based on fossil fuels and non-renewable energy sources to more sustainable and environmentally friendly forms of economy. The aim of the green transition is to achieve sustainable development by reducing greenhouse gas emissions, protecting natural resources and promoting green technologies and practices. It is a key element of global efforts to combat climate change.
Instytut Ochrony Środowiska – Państwowy Instytut Badawczy (IOŚ-PIB)	The Institute of Environmental Protection – National Research Institute (IEP-NRI), https://ios.edu.pl/en/
Internet of things (IoT)	A network of physical objects, 'things', that are equipped with sensors, software and other technologies to connect and exchange data with other devices and systems via the Internet.
Landfill	A structure designed for the storage of waste.
Landfill mining	The process of extracting and processing solid waste that has previously been sent to landfill.
Life cycle assessment (LCA)	A comprehensive method of analysing the environmental impact of products, technologies, systems and services throughout their life cycle, from raw material extraction, through production, distribution, and use, to waste management.
Machine learning (ML)	The field of machine learning belongs to the branch of science encompassing artificial intelligence. It is an interdisciplinary science, incorporating computer science, robotics and statistics. Its main goal is the practical application of artificial intelligence to create an automatic system that can improve itself based on experience (i.e., data) and acquire new knowledge on this basis.

Municipal waste	Waste generated in households and waste from other waste producers which, due to its nature and composition, is similar to household waste, in particular unsorted (mixed) municipal waste and selectively collected waste from households and other sources. (Directive 2008/98/EC)
Product environmental footprint (PEF)	The result of an assessment of a product's environmental footprint based on the method for determining this in the Commission Recommendation (EU) 2021/2279 of 15 December 2021.
Recycling	Recovery in which waste is reprocessed into products, materials or substances used for their original purpose or other purposes; this includes the reprocessing of organic material (organic recycling), but does not include energy recovery and reprocessing into materials to be used as fuels or for earthworks. (Directive 2008/98/EC)
Safety instrumented systems (SIS)	A designed set of hardware and software controls which provides a protective layer that shuts down a chemical, nuclear, electrical, or mechanical system, or part of it, in the event of detecting a hazardous condition. (https://en.wikipedia.org/wiki/Safety_instrumented_system)
Selective waste collection	Waste collection in which a given waste stream, in order to facilitate specific treatment, includes only waste with the same properties and the same characteristics.
Sustainable development	Intergenerational solidarity based on finding solutions that guarantee further economic growth, which allow for the active inclusion of all social groups in development processes, while giving them the opportunity to benefit from this growth.
Treatment	Recovery or disposal processes, including preparation prior to recovery or disposal. (Directive 2008/98/EC)

Urban mining	The process of recovering valuable raw materials from used products (e.g., vehicles, electronic equipment), installations, buildings and other infrastructure elements. It is a form of recycling secondary raw materials, which indicate the possibility of finding valuable resources where human activity has left its mark.
Virtual reality (VR)	An image of artificial reality created with the use of information technology. VR involves the multimedia creation of a computerised vision of objects, spaces and events. It can represent both elements of the real world (computer simulations) and completely fictional elements (e.g., science fiction computer games).
Waste	Any substance or object which the holder discards, intends to discard or is required to discard. (Directive 2008/98/EC)
Waste collection	Gathering waste prior to its transport to processing sites, including preliminary sorting that does not significantly alter the nature and composition of the waste and does not result in changing its classification; waste collection also includes the temporary storage of waste.
Waste disposal	Any process that is not recovery, even if the secondary effect of such a process is the reclamation of substances or energy. (Directive 2008/98/EC)
Waste management	The generation of waste and its management.
Waste processing	The collection, transport or treatment of waste, including sorting, together with the supervision of these activities, as well as the subsequent management of waste disposal sites and the activities performed as a waste dealer or waste broker. (Directive 2008/98/EC)
Waste storage	Temporary storage of waste, including: initial storage of waste by the producer, temporary storage of waste by the operator, collection of waste and storage of waste by the operator, as well as waste treatment.

Directive 2008/98/EC. Directive (EU) 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098