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report

Green Competences in Small and Medium Enterprises in Europe

Co-funded by the Erasmus+ Programme of the European Union

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Network for Small and Medium Enterprises

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Green Competencies in Small and Medium Enterprises in Europe

Study report on environmental competence needs in SMEs (waste, air, water, sewage)

Study Report:

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Introduction

The threat of climate change, care for the environment, and growing costs of exploiting natural resources have business pondering the use of modern measures which optimise the use of natural resources. One of the most important conditions for implementing such solutions in terms of environmental economy is having employees with appropriate knowledge and competences. In this context, it is appropriate to discuss the need for "green competences" in employees.

This report is an attempt to answer the question of competence needs in European Small and Medium Enterprises (SMEs) in terms of environmental management. At the same time, it is a form of dissemination of best educational practices in environmental economy found in selected European countries. Seven countries (Austria, Finland, Lithuania, Germany, Norway, Poland, Hungary) were the subject of a study aimed at identifying the competence needs of companies in terms of environmental management, which will be used in the long term to design educational programmes in this field. The study was conducted within the "Management and Technologies of Water, Waste Water, Waste and Circular Economy" project financed under the European Erasmus+ programme. The project includes the development and implementation of innovative educational programmes covering skills in technologies and management of drinking and industrial water supply, sewage safety, especially in terms of decentralised and environmentally friendly processes, waste management, resource saving and recycling, and circular economy. This report refers to other measures undertaken across Europe in terms of the need for identifying new competences which are necessary for effective implementation of actions related to modern, ecological environmental management. One example of such reports is the one prepared by the European Centre for the Development of Vocational Training (CEDEFOP), "Skills for green jobs: 2018 update. European synthesis report" which presents examples from several European countries, highlighting the significance of "green competences" and their need for support across Europe. It identified gaps in "green competences", or ecocompetences, in the vocational and trade education systems of the studied countries. It is necessary to adjust the educational programmes and training offer to the demands of "green economy". This Report also presents studies conducted in selected European countries which refer to the concept of competence gaps in terms of green competences, within the context of Small and Medium Companies, focusing on their competence needs relating to waste management, as well as air, water, and sewage management.

The report is divided into eleven chapters, where the first is a review of literature on environmental management and competence needs of companies. It indicates that environmental issues, or environmental management, occur in each and every company, including those classified as Small and Medium Companies (SMEs). Valid environmental management may become a significant source of competitiveness among

companies. Hence the increasing importance of green competences. This chapter also discusses the areas of creating a company's green skills. It refers to the results of current research conducted on gaps in green competences across European countries. The next chapter looks into the methodology of the conducted studies. Chapter two details the applied research methodology and briefly describes the sampled companies. The seven chapters which follow present the results of our research in specific European countries participating in the project. Each chapter outlines the results of quantitative and qualitative (responses from experts on environmental management) research conducted in these countries, as well as examples of best practices. Chapter ten concludes the research in the form of a synthesis of the results for the total sample of 99 companies from Austria, Finland, Lithuania, Germany, Poland and Hungary. Finally, chapter eleven contains a description of the methodology for developing educational recommendations and recommendations for three levels of education.

1. Environmental management and competence needs of companies

There should be no doubt that rational and economical environmental management requires a set of specific competences. The significance of education focusing on sustainable development is expressed in the Strategy in Education for Sustainable Development which identifies and prioritises the main objectives of environmental education, and proposes methods for their implementation. According to the strategy, the informal and non-formal goals of learning should facilitate the understanding of the relationships between social, economic, and environmental matters in a global and local context[1]. The assumption here is that environmental education should involve the whole community, including all age groups, professions, as well as central and local decision makers. This assumption is completely agreeable, but it does pose a challenge for preparing more detailed objectives, educational content and methods for the various target groups. This publication takes up the issue of educational needs in Small and Medium Enterprises.

In terms of the economic sector, the traditional approach to the context of environmentalism focused more on large enterprises, which clearly exploited the natural environment, especially in the extractive and industrial fields. Frequently, use of the natural environment was associated with specialised installations or equipment. However, it must be noted that each and every entrepreneur uses the environment, for example, by emitting fumes in the means of transportation used for business, using energy, or generating waste. Clearly, the scope and intensity of the impact on the environment depends on the specificity and scope of business. Nevertheless, we must assume that environmental matters or environmental management are presents in every company, including those classified as Small and Medium Enterprises (SMEs).

The need for environmental management in all types of enterprises does not fully exhaust the basis for the significance of this area. It is worth examining the importance of environmental management from the perspective of carrying out fundamental economic goals and development of modern enterprises. It is generally justified to assume that the relationships between entrepreneurs and the environment have an increasingly important role[2]. It may be argued that correct environmental management may become an

[1] Strategia Edukacji dla Zrównoważonego Rozwoju, Europejska Komisja Gospodarcza ONZ, Warszawa 2008.
[2] See, for example: A. Kubasik, *Obszary kreowania kompetencji ekologicznych przedsiębiorstwa*, Studia Ekonomiczne / Akademia Ekonomiczna w Katowicach 2006 | nr 37 Zarządzanie strategiczne w przedsiębiorstwie | 157-172

important source of competitiveness. For example, E. Mazur-Wierzbicka lists three aspects of economic benefits for a company related to care for environmental matters[3]:

- Cost efficiency resulting from rational resource and energy management;
- Changes in the way how work is organised in a company and organisational culture to indirectly impact the growth of innovativeness or employee motivation;
- Environmental activity (through expanding environmental goals across products and services) affects the expansion of the scope of business and, consequently, available outlets.

Other authors also write about the competitive benefits resulting from environmental management. For instance, M. Krawczyk indicates that based on studies of benefit analyses, companies express interest in cost efficiency, improved company image, and compliance with legal regulations[4]. However, Krawczyk also notes that the practical involvement of companies in environmental activities is directly proportional to their size. The source of this situation must most likely lie the restrictive regulations applied to large companies. Interestingly, it was indicated that such regulations are often the basic condition for any environmental activity in a company. Among the basic factors which determine whether a company undertakes any environmental activities, apart from the legal requirements described earlier, there is also external pressure and other business and economic aspects[5].

Assuming that activities relating to environmental management are evident aspects of any company's functioning and considering the importance of this scope for the competitiveness of companies, the question arises of why companies introduce environmental measures only when under external pressure, which includes legal regulations. It seems that within this issue, a hypothesis may be formulated that the relatively low level of economic activities results from insufficient competences seen in companies. This view is also presented by Krawczyk, quoted above, who stated that the results of studies conducted on both companies and consumers indicate that environmental activities are, in business practice, an essential factor establishing competitive advantage, assuming, however, that insufficient environmental measures in Poland result from the low level of knowledge on the subject[6].

The significance of possessing competences in terms of environmental management, which can be defined as ecological competences, is also indicated by A. Kubasik, who showed that establishment of correct environmental interactions by companies requires specific type of ecological competence. However, Kubasik understands ecological competences as the ability to effectively combine ecological resources, identify

[3] E. Mazur-Wierzbicka, *Wpływ zachowań proekologicznych na konkurencyjność przedsiębiorstw*, w: *Przedsiębiorstwo i państwo – wybrane problemy konkurencyjności*, red. T. Bernat, Katedra Mikroekonomii Wydziału Nauk Ekonomicznych i Zarządzania Uniwersytetu Szczecińskiego, Szczecin 2007, s. 34.
[4] M. Krawczyk, *Konkurencyjność przedsiębiorstw w świetle uwarunkowań ekologicznych*, Zachodniopomorska Szkoła Biznesu w Szczecinie, Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzanie nr 25
[5] Ibid.
[6] Ibid.

relationships between the various components of the environment, and minimise ecological risk[7]. Taking into account the increasing social and business costs of environmental use, it is justified to also draw conclusions in terms of the growing importance of ecological competences in the total set of a company's competences. It is also safe to assume that in certain conditions, such competences may become the key or distinctive competences, around which companies would build their competitive advantage.

The formation of these competences at a business level must involve implementing a permanent learning process for employees. A. Kubasik assumes that ecological skills are established across several areas which are essential for a company's activity and growth, namely:

- relations with authorities and institutions which supervise the implementation of state environmental policies and active participation the formation of such policies,
- designing and utilising environmental management systems, as well as integrated systems which combine matters of quality, environmental protection, and work safety,
- logistical processes, including supplier relations in terms of cooperation for the maintenance of established environmental standards of resources and materials,
- cooperation and competition with environmental organisations and research institutes,
- sources of financing environmental activities and factors creating the value of a company,
- relations with the public,
- designing ecological products as well as ecological technologies and processes

The main, but also the traditional area of a company's activities, which generates competitive requirements in terms of environmental management is the relation with public authorities, especially in relation to legal regulations on environmental policies. In terms of EU member states, for example, in Poland, this also means the relations with European authorities and laws.

As Poland became a member of the European Union, the environmental sphere in business activities became a factor with larger significance, which has to be taken into account in decision-making. In regulatory terms, legislature and decisions by administrative bodies determine the conditions and methods of utilising the environment. On the one hand, these form direct legal responsibility for specific actions, on the other hand they form product-oriented environmental instruments which affect the profit and loss balance resulting from the generated pollution (financial incentives, deposits, subsidies, fees) used by states or the EU to affect the behaviour of companies (including market formation). Legal regulations also apply to the duties of entrepreneurs resulting from the expansion of manufacturer responsibility for the final product to the service and post-service sphere. This applies to such things as packaging and packaging waste and results in companies trying to fulfil their recycling responsibilities and the consequential obligations, possible benefits, and situationist requiring additional regulations.

[7] A. Kubasik, *Obszary kreowania kompetencji ekologicznych przedsiębiorstwa*, Studia Ekonomiczne / Akademia Ekonomiczna w Katowicach 2006 | nr 37 Zarządzanie strategiczne w przedsiębiorstwie | 157-172

Taking into account the number and variability of legal regulations, and the number of institutions involved in implementing environmental policies, any enterprise, also those in the SME sector, should appreciate the need for competences in such respect. Significant studies conducted on Polish entrepreneurs confirm that legal regulations and the threat of fines is the decisive factor which motivates businesses to get interested in how their companies impact the environment. The authors of the study report postulate that: *As the most important issue for businesses, especially SMEs, is being up-to-date with the applicable legislature, it would be an important feature of information services to indicate the current legal regulations on these matters*[8]. Services related to the improvement of entrepreneurs' competences, as supported by the authors of the cited study, should relate to the fundamental legal and administrative requirements, and the motivation to use them by entrepreneurs lies in reducing financial risk, related to fines and fees for the use of the environment.

These observations also confirm the significance of adjusting to the legal regulations as an essential motivator for environmental actions, but also indicates the importance of expanding the competences in this respect. In Poland in particular (but also in other counties), legal requirements, incomprehensible legislature and its constant variability stimulate the increasing demand for specific competences in companies.

Environmental activities in businesses are not solely limited to complying with the bare legal minimum, but are also expressed in the implementation of environmental management systems. The motivation for introducing such systems can lie in improving efficiency, reducing costs, but also from the care for the company image.

The most prominent system of environmental management is the ISO 14001 series of standards. Their function is to provide organisations with components for effective environmental management which can be integrated with other managerial requirements, so that a company may reach its environmental and economic objectives. The standard also defines the requirements for a environmental management system that can be used by a company to improve its environmental impact. Its intended for organisations which want to systematically manage its environmental obligations, which contribute to the environmental pillar of sustainability. The standard facilitates organisations' achievement of established environmental management results, which add value to the environment, the organisations and their stakeholders. According to organisational environmental policies, the established results of environmental management systems include[9]:

- improvement of the environmental effects of activity,
- fulfilment of compliance obligations,
- achievement of environmental obligations.

The standard maybe implemented by any organisation, irrespective of its size, scope and character. Also, the standard is applicable to those aspects of environmental activities, products, and services, which the organisation defines as under its supervision or impact across its life cycle. The process of identifying

[8] Ochrona środowiska i ekoinnowacje, Raport końcowy, PARP, czerwiec 2010

[9] Norma PN-EN ISO 14001:2015— System zrządzania środowiskowego, Polski Komitet Normalizacyjny, Warszawa 2015.

environmental factors should include the environmental impacts which could arise in result of regular and irregular conditions as well as emergency situations. A company must also be capable of establishing the assessment criteria of environmental aspects. It is important for companies to be able to establish and document environmental objectives and tasks. Realistic objectives paired with the demand for a certain level of ambitions makes it necessary for companies, among other things, to identify the best available technique (BAT), best available techniques not entailing excessive costs (BATNEEC), and assess their viability. Significantly, the standard may be used fully or in part in order to systematically perfect environmental management. However, declarations of ISO 14001 compliance are acceptable only when all of the standard's requirements are included in the organisation's environmental management system and are met without any exclusions.

Another standard is the Eco Management and Audit Scheme (EMAS). This is an instrument developed by the European Union in order to encourage organisations (companies, manufacturers, institutions) to continuously improve their environmental management efforts, so that such activity is treated on equal terms with other aspects of managing the organisation. It is worth noting that while ISO 14001 is an important component of EMAS, the Eco Management and Audit Scheme utilises a wider and more restrictive approach. The benefits of implementing EMAS not only relate to the reduction of business costs and limiting negative impact on the environment, but also contribute to more effective risk management (reducing the likelihood of failures and accidents and minimising their possible effects by emergency procedures). It also provides the possibility of documenting that the activity is conducted in accordance with the law which further increases reliability among clients, investors, administrative authorities, and supervisory bodies[10].

It may be said that EMAS is a useful instrument for establishing a sustainable culture in an organisation and for effective management of available resources and energy. The system's requirements provide instruction and specific guidelines which can be used by organisations to arrange their obligations in terms of environmental protection, optimise incurred costs, and effectively manage energy and resources. Registration in the EMSA Eco Management and Audit Scheme means that the organisation meets the most restrictive environmental protection requirements. The system also provides significant advantages to the organisation's image through the prestige of being among those companies which conduct their business in line with the idea of sustainable development.

There are also industry specific environmental management systems. FSC (Certification System of Product Origin and Forest Management Control) is one example of such industry specific certification systems, which outlines the procedures in forest management and product origin control which should be followed by organisations in the wood economy chain to be awarded a certification and use the globally recognisable logo[11].

[10] System ekozarządzania i audytu EMAS funkcjonuje w oparciu o Rozporządzenie Parlamentu Europejskiego i Rady (WE) nr 1221/2009 z 25 listopada 2009 r. w sprawie dobrowolnego udziału organizacji w systemie ekozarządzania i audytu we Wspólnocie, www.emas.mos.gov.pl/emas3.html [access: 28.03.2020]

[11] Certyfikacja Gospodarki Leśnej, https://pl.fsc.org/pl/certyfikacja-fsc/certyfikacja-gospodarki-lesnej [access: 28.03.2020]

Environmental management systems such as ISO 14001 and EMAS, but also industry specific systems or procedures tailored to the needs of specific companies provide information which may be later used to reduce the use of resources in production, as well as reduce the production of waste. The knowledge of standards and the ability to implement them should be considered as potentially useful competence in any company. It is appropriate to draw the conclusion that education in terms of the concepts of environmental management systems should be a component environmental education.

Logistical processes are another area of competence and educational needs in SMEs. Companies must be aware of the environmental consequences of the logistical operations carried out within its supply and sales chain. Because of increasing personalization of production and customer services, implementation of just-in-time strategies, and growing trends for reverse logistics (waste management), tendencies to streamline supply chains, there is an increasing need for transportation services. Transportation is closely related to environmental pollution. It is safe to assume that contemporary logistical systems exert increasing pressure on the environment, all the while becoming ever more significant cost factor for companies. This means that environmentally focused optimization of logistical processes could be the correct approach which would reduce exploitation of the environment as well as become a factor for improving business competitiveness. The concept could be called green logistics which is aimed at effective end efficient realisation of logistical processes all while minimising the impact on the natural environment.

The implementation of such approach to green logistics definitely requires competences in terms of combining logistical processes with reduced impact on the environment, as well as resource saving. It is also worth noting that even if SMEs have logistics specialists, this may still be insufficient to ensure competence in terms of reverse logistics. It would be currently justified to opt for both including reverse logistic schemes in the curricula of university courses on logistics, as well as the ongoing need for continuous education of employees in this field.

Environmental organisation are gaining a stronger position across Europe. Such organisation gain significant influence for shaping the decisions made by public authorities, as well as forming popular opinion. Conflicts with such organisation may create risk for companies not only in terms of image, but also directly reducing their turnover. Severe clashes with environmental organisations may also lead to legal disputes and potentially enormous negative financial consequences, as well as undermined trust among clients and stakeholders. These threats do not negate the potential for advantageous cooperation with such organisations. Environmental organisations and research institutes may provide expert knowledge in specific areas. Cooperation with such entities has a positive effect on a company's image. Companies must therefore face the challenges of effective relationship building under so-called green alliances, which may also become the source of competitive advantage. Competences in terms of cooperating with environment of ecological organisations as well as science and research institutes can and should be a necessary component of SME's ecological education.

However, correct use o environmental management processes in itself may prove insufficient from a company's competitive perspective and growth if the public is unaware of this company's environmental activities. There is no doubt that some clients, or the general public, pay attention to environmental behaviour in the sphere of consumption, and personal decisions in other spheres. Companies as well as other

organisations therefore face a new challenge of mastering the skill of effectively communicating their actions and attitudes in terms of public relations. This can also be called ecological competences in public relations. Shaping communication in this respect may begin at the level of a company's mission statement, by including declarations concerning care for the environment, making products which are safe for the environment and safe to use, as well as taking responsibility for disposing spent products. However, declarations in themselves are not enough and should be supported by the ability of implementing ecological aspects in all areas of public relations. It is worth realising that this may also apply to including ecological messages in such areas as:

- publicity (media relations) - cooperation with mass media,
- corporate identity - creating a company's identity,
- public affairs - establishing and maintaining advantageous relations with local, regional or national authorities,
- community relations - establishing good relations with local communities,
- press relations - includes preparing current updates and posting them in the media in order to bring attention to a product or service,
- lobbying - creating and maintaining relations with legislative and government bodies in order to influence legislature and regulations, frequently across whole industries or sectors, and to obtain favourable, individual decisions,
- crisis management,
- investor relations 0 maintaining contact with shareholders and other members of the financial community,
- cooperation with donors and non-profit organisations - aimed at obtaining financial or voluntary support[12].

The ability to fill the above mentioned components of public relations with ecological themes should be supported by ecological education in SMEs.

Public action at the level of the European Union at the national, regional or local level aimed at counteracting climate change, environmental protection, circular economy result in access to numerous funds for environmental measures. Significant part of such assets can be utilised by Small and Medium Enterprises for environmental activities as well as those which increase their efficiency and competitiveness. For example, there are funds for the improvement of energy efficiency or water management. The possibility of using these funds is however determined by the limited capacity of small companies in obtaining public funding. Firstly, it is necessary to have knowledge about currently available sources of financing environmental activities. It is also necessary to have the competences to prepare applications, carry out and account for environmentally oriented projects. Smaller organisations in particular need support in this respect. It can therefore be claimed that education on available environmental funds, preparation, implementation and settlement of projects in this respect is an important component of ecological education aimed at SMEs.

[12] See, for example: Encyklopedia Zarządzania, https://mfiles.pl/pl/index.php/Public_relations, [access: 28.03.2020]

The last discussed dimension of the required environmental skills is the design of green products and green technologies and processes. This area is extremely important as it determines to a great extent the actual environmental impact of a company. The design of products and processes has a strong impact on the overall efficiency and competitiveness of companies. The lack of knowledge in this area can be solved already at the stage of training specialists in various technical disciplines by taking environmental aspects into account. However, in the context of functioning SMEs, the improvement of competence in product and process design can be carried out in the form of training or specialised advice in various economic sectors.

It can be concluded that there are a number of important dimensions of environmental skills necessary in Small and Medium Enterprises. In this context, it is worth referring to the research conducted in European countries on the so-called green skills. The most comprehensive research in this area is conducted by The European Centre for the Development of Vocational Training (Cedefop). In 2010, Cedefop and the International Labour Organisation (ILO) jointly developed the Green Job Skills Report based on national research. The research covered the following EU countries: Denmark, Germany, Estonia, Spain, France and the UK. The report examined the political context, the role of stakeholders in vocational education and training. In addition, it included good practices in addressing educational challenges related to the emergence of new green jobs and the greening of existing professions. The Cedefop report presented the main needs for green skills[13]. The research was then repeated in 2017 and a new report was published in 2018[14]. The latest Cedefop report also provides a synthesis of information analysed in six countries. The analysis covered the main developments in green jobs and employment since 2010 and legislation and policies to support green skills and employment, including the institutional set-up of the environment and the role of social partners. Green skills development policies are also described, including green skills anticipation mechanisms, relevant VET provisions and the role of higher education, active labour market policies, including retraining, and the role of the private sector. An important finding of the Report is that there is no common approach to green skills in six countries, including even no common definition of green skills and green jobs. The support for the green economy varies from country to country. In most cases, green skills are covered by different mechanisms of public policies, both environmental and educational. Legislation, policies and strategies with a clear focus on green skills and jobs are rare in six countries There are strategies, plans and legislation on the environment or sustainable development in each country, where green skills issues can be found. Such documents provide a framework for discussion on green jobs and skills, although they are not usually deliberately developed in the context of the competence needs of green economy. A sectoral and regional/local approach is used in practice. Green skills needs are usually taken into account in general forecasting and through one-off surveys. Coordination between different policy areas is therefore necessary. Comprehensive and comprehensive policies are needed to develop green skills. The authors conclude that so far the forecasting of green skills is done on an ad hoc basis instead of a regular and systematic process of defining them. There is a clear demand for the integration of actions for environmental education, which so far have been elements of very different policies. Relatively good solutions in the field of green skills exist in

[13] Skills for Green Jobs European Synthesis Report, Luxembourg: Publications Office of the European Union, 201, http://data.europa.eu/doi/10.2801/750438 [access: 29.03.2020]

[14] Cedefop (2019). Skills for green jobs: 2018 update. European synthesis report. Luxembourg: Publications Office. Cedefop reference series; No 109. http://data.europa.eu/doi/10.2801/750438 [access: 29.03.2020]

Germany, but even here we cannot speak of full integration and systemic approach. The national sustainability strategy has been in force in Germany since 2002. It is updated every two years and strengthens the incentives for the integration of green and sustainable skills in education and training. However, there is no coherent strategy to address the needs of the green economy. Instead, action has been taken to address this lack of green skills in vocational schools and universities. The institutional set-up around green skills is characterised by weak links between, on the one hand, organisations involved in national policy-making on environmental issues and, on the other hand, organisations involved in the functioning of the labour market and in education and skills forecasting. In Germany there is no inter-ministerial coordination institution around green skills and these are usually treated as part of other decisions, structures and processes. As a result, it can be argued that they tend to sink between gaps in existing institutions.

The CEDEFOP report confirms that permanent mechanisms to predict the competence needs of the green economy are currently rare in the countries covered by the synthesis. The notable exception is France, which has a dedicated observatory. Most often, however, the anticipation of green skills is part of the overall mechanisms of skills anticipation. An example is Estonia, which only recently introduced a comprehensive approach. In Spain, the National Observatory of Occupations is a network of regional institutions. The skills gaps related to the professions selected for analysis every year are analysed by regional expert groups. Within green occupations and the corresponding skills gaps, the Observatory's 2017 annual report identifies for example the following gaps[15]:

Green occupation	Skill gaps identified
Forest and environment agents	Prevention of forest fires; topography; use of compass; driving of vehicles
Qualified workers in hunting activities	Veterinary first aid, environmental protection, plants, wildlife, fire prevention and management
Forest fire workers	Use of specific radio networks (Tetrapol)
Qualified workers in forestry and natural environment activities	Occupational risk prevention, pruning, fabrication of biomass, natural environment, use of chainsaw
Prevention of labour and environment risks agents	Law, new chemical substances, nanotechnology

[15] National observatory of occupations, 2017 annual report. Source: Cedefop (2018d). Skills for green jobs in Spain: an update. This report also contains a full list of the respective occupations; http://data.europa.eu/doi/10.2801/750438 [access: 29.03.2020]

Waste classification workers	Differentiation of types of waste and treatment for each type of waste. In the future, training on new regulations, new materials and new waste management systems can be needed
Environmental and forest technicians.	Cost and process analysis of forest exploitation, forest certification (PEFC and FSC), forestry-related legislation, management and planning methodologies
Vehicle cleaners	Environmental background
Sweepers	Waste classification according to environmentally friendly criteria
Power plant technicians	Electric cogeneration in small power plants; wind turbines
Electricity technicians	Renewable energy; energy efficiency; electric and hybrid vehicles; LED lighting

In most of the countries surveyed, the regional level plays a greater role in providing green skills training than in forecasting green skills. However, regional training often includes an element of data collection to identify regional needs.

As regards lifelong learning in green skills, six countries surveyed in the Cedefop Report conclude that there has been a significant development since 2010, in response to an increase in green employment. However, this development has not been driven by governments, legislation or strategies. Rather, it has been done as a bottom-up process of identifying the skills required by the labour market, which have been incorporated into VET programmes. It is noted that there were two mechanisms. Firstly, new skills, processes are applied to new green jobs. Secondly, green skills related to green employment are taken into account for existing occupations. The prevailing view in all countries is that there are few new green jobs. In contrast, the impact of greening the economy and employment is mainly in the form of new green skills in existing occupations. As a result, training mainly consists of adding green elements to existing qualifications or programmes. In Spain, for example, it is assumed that workers with similar occupations can pursue green jobs if they are provided with appropriate additional training. The following examples of green activities in traditional sectors in Spain can be mentioned[16]:

[16] Cedefop (2018d). Skills for green jobs in Spain: an update. https://skillspanorama.cedefop.europa.eu/en/useful_resources/skills-green-jobs-spain-update-2018 [access: 29.03.2020]

Traditional sector	Green activity
Auxiliary automotive industry	Components for wind turbines
Electronic components and electricians	Components for wind turbines
Civil public works	Construction of thermoelectric generators
Chemical and electronic industries	Photovoltaics
Agriculture	Biomass activities
Shipyards	Offshore wind farms
Plumbers	Solar thermal energy

In France, three categories of occupations have been identified: new green occupations, occupations requiring the adaptation of skills by adding modules or redesigning the training path, and occupations where awareness-raising is needed, such as helping drivers to understand how to adapt their driving techniques to make their work greener. In Germany, in contrast, many analyses have shown that new vocational training programmes or new university courses are not needed for the green economy transformation. Instead of creating new programmes, it is more appropriate to adapt existing qualifications by including green qualifications.

However, there is no doubt that green skills should be reflected at higher education level. The Cedefop report notes that universities are committed to providing green skills courses, but using their autonomy they assess the need for green curricula and adapt to it. It has not been noted that universities are involved in government policies to develop green jobs and prepare training programmes for them. Nevertheless, examples of good practice were noted in the bottom-up activities.

Danish university provision includes three-year bachelor programmes in environmental technology, and energy technology and planning, along with two-year master programmes in water and environment, and environmental and natural resource economics. In France, the vocational licences (level II, *Licence professionnelle*) launched by universities on the basis of identified skill needs include new licences such as *Eco-design*. Data collected in France shed light on the types of programme recently developed. Between 2008 and 2011, 100 vocational bachelor degrees (*Licence professionnelle*) were created, one third of which were in energy (mainly sustainable construction and renewable energies) and one quarter in pollution prevention. There were also more than 120 new master programmes, especially in nature protection and the prevention

and reduction of pollution[17]. Universities sometimes engage with individual or groups of businesses to set-up specific forms of provision. These may be stimulated by government action, though frequently they come as a result of close links between universities and their local business communities.

A review of international experience with the development of green competences confirms that there are many actions taken at different levels of education in this area. Both new and green curricula for vocational education and training and university level education are emerging. At the same time, it seems that two important weaknesses in the measures taken can be observed. Firstly, the lack of a holistic, comprehensive or integrated approach to the development of green competences in individual countries or in the EU. Secondly, the weaknesses concern the identification and forecasting of the needs for green competences. Often, training activities are, as outlined above, ad hoc without in-depth research. The need for research is all the more justified given that, as shown above, there are many dimensions of eco-competence skills, as well as an important diversity of actors who need them (e.g. young people, businesses, public organisations, third sector organisations, etc.).

From this perspective, in the context of the topic of this publication, it is worthwhile to look at the examples of research into the green competence needs of small businesses. It should be assumed that the specificity of Small and Medium Enterprises may occur. This is justified by the fact that while large companies have specialised departments, units or independent environmental positions, small companies do not have specialised staff to monitor and control both the performance of work and compliance with all legal requirements. Research on the state of knowledge and training needs of the staff of small and medium-sized metal sector companies is reported by I. Kacak and K. Skoczylas[18]. The reported research formulated such research questions as: What professional competences of the staff of metal sector enterprises should be improved to support the culture of "green" thinking and "green" work in an enterprise? What methods and forms of education/improvement are preferred by employees of enterprises? The main objective of the research was to collect and analyse information on the knowledge and training needs of employees on environmental issues in the metal sector. The survey was conducted in 2013 on a sample of 125 jobs in 84 European metal sector companies: Spanish, Polish, French, German, English[19]. In the analysis of the survey results, the importance indicator of professional tasks was used (4-level scale). The scale of assessment: High importance - Medium importance - Low importance - Not important, was assigned numerical values 4 - 3 - 2 - 1 respectively. Table 1 presents the results of the analysis of the importance of professional tasks of employees dealing with environmental protection issues in the company.

[17] Cedefop (2018d). Skills for green jobs in Spain: an update. https://skillspanorama.cedefop.europa.eu/en/useful_resources/skills-green-jobs-spain-update-2018 (29.03.2020)
[18] I. Kacak, K. Skoczylas, *Badanie świadomości prośrodowiskowej pracowników MSP sektora metalowego*, Edukacja ustawiczna dorosłych 2013, 4(83), s. 132-140
[19] Ibid.

Table 1: Importance of tasks of employees dealing with environmental protection issues in the company

Environmental issues	Value of the importance indicator
Compliance with environmental legislation (laws, regulations, executive acts) clearly affecting the activities of the enterprise	2,4
Identifying and ensuring compliance with the environmental requirements of the enterprise	3,9
Identification of potential sources of environmental pollution from the company's production processes	2,3
Assessment of solutions to reduce or eliminate environmental pollution emissions	3,6
Planning, improving and implementing environmental policy in the company	3,8
Creation and application of procedures in environmental emergencies	3,7
Implementing and providing an environmental management system (ISO 14001/ EMAS)	3,7
Monitoring and measurement of harmful emissions (air, water, waste)	3,7
Monitoring and control of identification, labelling and waste management activities	3,7
Applying for the relevant permits in public administration bodies	3,6
Contacting authorised bodies carrying out appropriate checks	3,5
Conducting information and communication activities with staff on environmental issues	3,5
Planning of employee training on environmental protection	3,6
Conducting the company's environmental information policy	3,6
Representing the company in the field of environmental management and control before external institutions	3,3
External environmental representation of the company (employers' associations, trade committees, etc.)	3,2
Monitoring and ensuring proper operation of environmental protection equipment	3,1
Ensuring compliance with the environmental requirements of subcontractors and suppliers	3,4

Conducting periodic audits of the company's environmental performance	3,6
Periodic monitoring of compliance with environmental requirements in the enterprise	3,4
Reporting of the company's environmental impact to local authorities	3,6
Management of company environmental documentation	3,4
Developing the environmental knowledge base	3,4
Updating of environmental legislation	3,6
Supervision/Monitoring of recommendations of local administration units	3,4
Monitoring and ensuring proper operation of environmental protection equipment	3,1

Source: I. Kacak, K. Skoczylas, *Badanie świadomości prośrodowiskowej pracowników MSP sektora metalowego*, Edukacja ustawiczna dorosłych 2013 | 4(83) | 132-140

The analysis of the results presented in Table 1 shows that the surveyed small companies attach the greatest importance to relatively general competence: Planning, improving and implementing environmental protection policy in the company, which can be understood as attaching importance to the whole range of pro-ecological activities. On the other hand, further competences, in recognition of their importance by enterprises, can be attributed to the dimension of designing and using environmental management systems and integrated systems: Creation and application of procedures in environmental hazard situations; Implementation and provision of an environmental management system (ISO 14001/ EMAS); Monitoring and measurement of emission factors of harmful factors (air, water, waste). It is interesting that this area has been particularly appreciated, not the area related to fulfilling formal and legal obligations. This can be interpreted as a relatively high level of environmental awareness of the surveyed companies. The reported research also included the self-assessment of the level of knowledge of their employees with regard to environmental protection issues, key opinions of small enterprises on the state of knowledge and training needs of SME employees. The surveyed respondents indicated pro-environmental thematic areas, which would expand their knowledge of activities that can be implemented to better adapt the company's processes and the skills needed to implement these activities/processes. The authors of the report conclude that the respondents have pro-environmental knowledge, but consider it to be incomplete (Table 2).

Table 2: Analysis of the knowledge of SME metal sector employees on environmental protection issues

Self-assessment of the level of knowledge of SME employees on environmental protection issues	Importance Indicator value
Environmental legislation	2,7

Licences, certificates	2,8
Waste-storage and storage	3,3
Waste reduction and recycling	4,0
Sewage treatment	2,5
Atmospheric emissions	2,5
Climate change	2,6
Noise level	2,7
Chemical impurities	2,8
Labelling, use and handling of chemical products	2,8
Storage of chemical products	2,9
Biological contaminants	2,2
Energy efficiency of production processes	2,7
Methods to minimise energy consumption	2,8
Renewable energy	2,5

Source: I. Kacak, K. Skoczylas, *Badanie świadomości prośrodowiskowej pracowników MSP sektora metalowego*, Edukacja ustawiczna dorosłych 2013, 4(83), s. 132-140

From the analysis of the self-assessment of the state of knowledge on environmental issues, also in the context of the above mentioned assessment of the significance of specific issues for enterprises, conclusions can be drawn as to the existing competence needs, which may become the basis for training activities. On the basis of the results presented in Table 2, the areas requiring training support include such issues as: biological pollution, renewable energy, sewage treatment, atmospheric emissions or climate change. The identified areas of competence deficits are very important and should be the basis for educational activities. The results of the reported study have become the basis for developing a professional competence profile of an environmental promoter in a company (referred to as: GreenPoint). The authors state that the professional competence profile of an environmental protection promoter in an enterprise for employees of four metal sub-sectors (machine, metal coatings, surface treatment, vehicle repair), can be used to describe positions and competence profiles, recruitment, selection and evaluation of employees, work valuation,

professional risk assessment. The next study proposed an innovative e-learning modular training programme for environmental promoters. The programme consists of 4 modules[20]:

Module 1 Global environmental problems

Key learning points:

- Environment, causes of resource depletion,
- Types of resources,
- Biodiversity,
- Global warming.

Module 2 Business and environment

Key learning points:

- Contributions, operations and final results,
- Energy consumption,
- Air pollution,
- Noise pollution,
- Water pollution,
- Soil contamination,
- Waste,
- Risk assessment of pollution,
- Transport and environment.

Module 3 Benefits for the enterprise in terms of environmental improvement

Key learning points:

- Saving and increasing company profits,
- Creating a safe workplace,
- Alignment with environmental legislation,
- Environmental management systems,
- Monitoring and measuring.

Module 4 Environmental control and innovation activities

Key learning points:

- Materials and products,
- Waste,
- Energy saving,

[20] I. Kacak, K. Skoczylas, *Doskonalenie „zielonych" umiejętności kadry przedsiębiorstw przemysłu metalowego*, Edukacja ustawiczna dorosłych 2014, 4(87), s. 150-158

- Water and sewage,
- Emissions of pollutants into the air,
- Transportation.

The approach presented should be considered as an important step forward in understanding the eco-competence needs of SMEs. However, its limitations are worth noting. First of all, as assumed by the authors themselves, the model of the competence profile and consequently the training programme refer to enterprises in the narrow metal industry and at least cannot be fully transferred to other industries. Secondly, the concept of reducing all the green competence needs of an enterprise to the function of one environmental specialist does not have to be the only solution, and in many cases it may turn out to be insufficient. In many companies, green competencies will be necessary for a larger group of employees - if not for all. Companies do not have to follow the model of appointing a separate position, which will have environmental protection in its name. Functions in this area may be dispersed among other positions. Some of these functions can be entrusted to external partners. The recommended model of professional competence of an environmental protection promoter in an enterprise should be understood rather as an indication of areas of competence needs, rather than strictly as a competence profile of a given position. It is worth noting, however, that for designing training or educational programmes, the level of detail obtained in the reported study is worth deepening. Further, more in-depth research on the detailed identification of training needs of Small and Medium Enterprises in the field of environmental economy is necessary.

2. Research methodology and characteristics of the surveyed enterprises

The quantitative survey was conducted in the period from October 2019 to March 2020 in the form of face-to-face interviews (PAPI) on a sample of 99 companies (including companies based in Austria, Finland, Lithuania, Germany, Norway, Poland, and Hungary). The basis for selecting the companies was size and type of business. Companies belonging to the category of Small and Medium Enterprises, operating in diverse economic sectors, were selected. The respondents were owners or managers of such enterprises.

The research survey was developed with the intention of identifying, on the one hand, the needs for green economy competences and, on the other hand, the state of competences of enterprises in this area. The responses were supposed to facilitate the identification of **"COMPETENCE GAPS" understood as the difference between competence needs and competences of companies in the field of green economy.**

The research questionnaire consisted of three parts:

- Information on the company (company size, core business),
- General information on the needs of environmental management (amount of expenses attributed to environmental management, use of renewable energy sources, impact of the activity on waste generation, air pollution, water consumption and wastewater production),
- Specific competence needs for environmental management, within four thematic blocks: waste management, air protection, water management, sewage management.

In the third part, the respondents were asked to assess **the competence needs/substantiality of particular competences related to environmental management** from the point of view of **the company's specificity**, on a scale from 0 to 3 (where 0 means that a given competence does not concern their company, 1 - is not important, 2 - is important, 3 - is very important). At the same time, they were asked **to assess the current state of competences** possessed by the company's employees on a scale from 0 to 3, where 0 means lack of competence, 1 - low competence, 2 - medium competence, 3 - very high competence

Among the surveyed companies, 38 were small enterprises, 33 belonged to the category of micro enterprises, the remaining 27 were medium-sized enterprises.

The largest number of enterprises subject to the analysis operate in industry (29 companies), the remaining ones belong to the industry related to company services (including services for companies), real estate (15

companies), trade and repair (13 companies), hotel and catering (6 companies), transport, warehouse management and communications (6 companies), construction (5 companies), service, social and individual activities (4 companies), education (1 company) and health care (1 company).

A total of 30 environmental management experts from 6 countries participated in the qualitative study. The experts were asked about cost optimization in the field of environmental management, training in environmental management, use of renewable energy sources and competence needs related to environmental management.

BFKK

competencies to work

WWW&CE

Water, Waste Water, Waste & Circular Economy

Austria

Österreich

Co-funded by the
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of the European Union

HANSE-PARLAMENT

Network for Small and Medium Enterprises

BFKK competencies to work

WWW&CE

Austria

Research in Austria was conducted by the Institute for Economic Promotion of the Styrian Chamber of Commerce. Seven companies operating in Austria took part in the survey. Among them, 3 were microenterprises, 2 belonged to the category of small enterprises and the remaining 2 were medium-sized enterprises, including 4 companies from the service, social and individual sectors (Figure 2). The survey also included companies from the transport and warehouse sector (1 company), trade and repairs (1 company) and industry (1 company). The chapter presents Austrian good practice in green competence development: Cycle (CYCLE CC) - Centre of Competence; Austrian ECO School Programme - Education for Sustainable Development (ECOLOG); Environmental Education and ESD for teachers - ENITE network; LIFE - DoppelPlus - Climate Campaign for low-income households; # GarbageToo (#MüllToo); Green jobs for green girls; Green Building Solutions.

Austria

Österreich

Co-funded by the Erasmus+ Programme of the European Union

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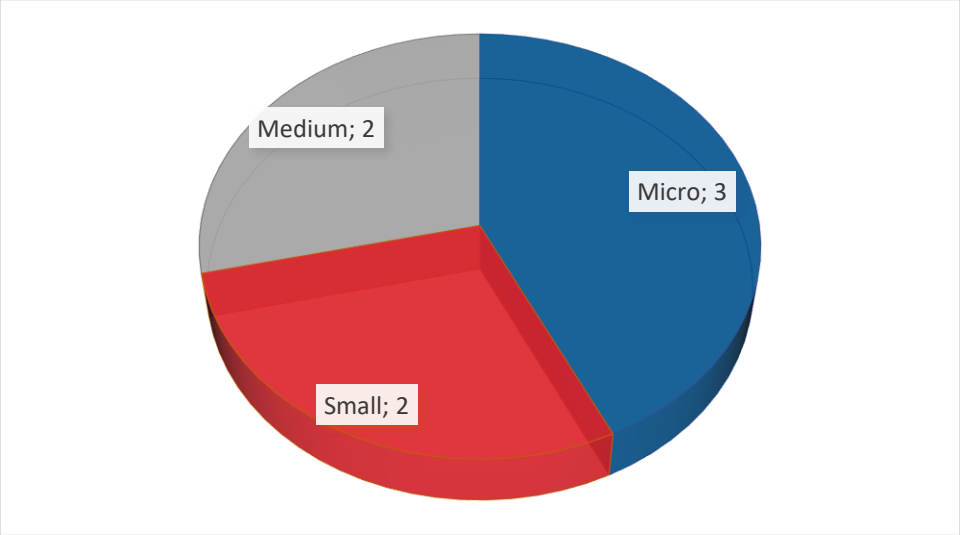
3. Austria

3.1. Results of quantitative studies on environmental management needs

The survey involved 7 companies operating in Austria. Among them 3 were micro enterprises, 2 were small enterprises and the remaining 2 were medium-sized enterprises (Figure 1).

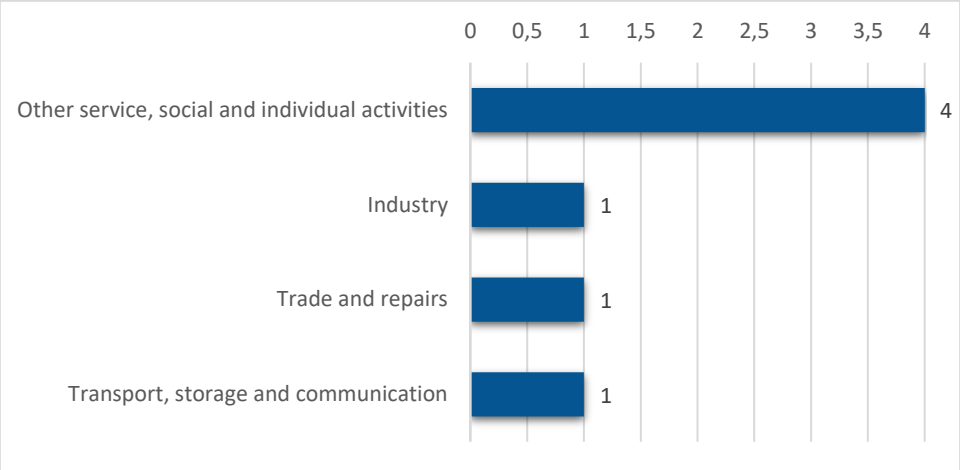
Figure 1: Company size – Austria



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

More than half of the analysed companies (4 companies) operate in the service, social and individual sectors (Figure 2). The survey also included companies from the transport and storage industry (1 company), trade and repairs (1 company) and industry (1 company).

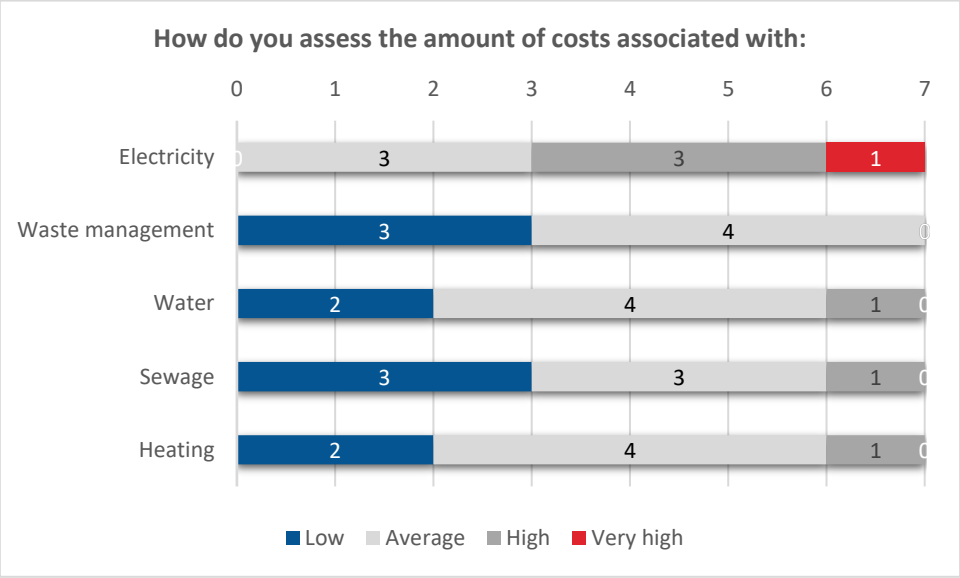
Figure 2: Main activity of the company - Austria



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

The entrepreneurs were asked to assess the amount of costs related to electricity, waste, water, sewage and heating in relation to the total costs in the company (Figure 3). Most answers revolved around statements of average or even low costs. The position was different for electricity, where 4 respondents stated that costs were high or very high. The remaining answers indicated an average level of electricity costs. It can be noted that environmental costs other than electricity still do not represent a significant share of total company costs in Austria, at least when taking into account mainly service and commercial companies, as in the examined sample.

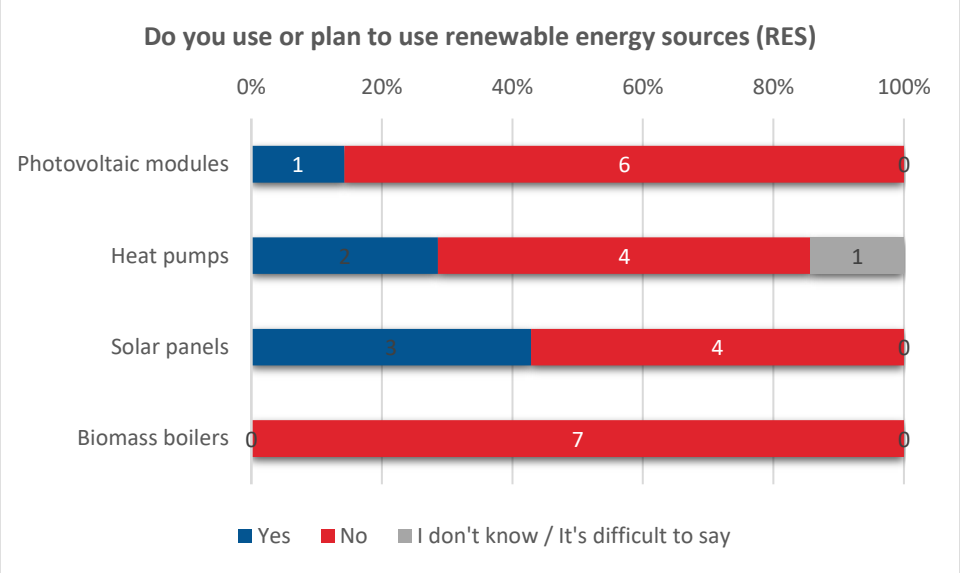
Figure 3: Costs incurred - Austria



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

In response to the question about the use of renewable energy sources (RES) and their planned introduction in the future, the majority of entrepreneurs stated that RES are not and will not be used (Figure 4). The largest number of affirmative answers concerned solar panels - 3 companies confirmed that they already use them or plan to use them in the near future.

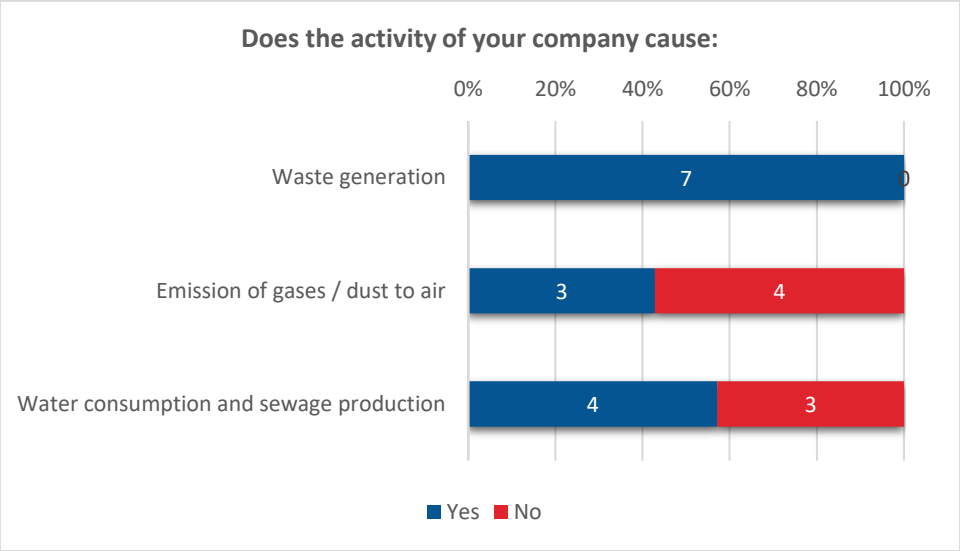
Figure 4: Use of renewable energy sources in companies - Austria



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

A filtering question was used in the research questionnaire in order to identify the possible types of pollution produced by the surveyed companies, which subsequently allowed to identify areas requiring detailed analysis in terms of competence needs in environmental management. On this basis, companies that produce waste (all of the surveyed companies), emit gases and dust into the air (3 companies), and use water and produce sewage (4 companies) were identified (Figure 5).

Figure 5: Types of pollution generated by companies in their business activity - Austria



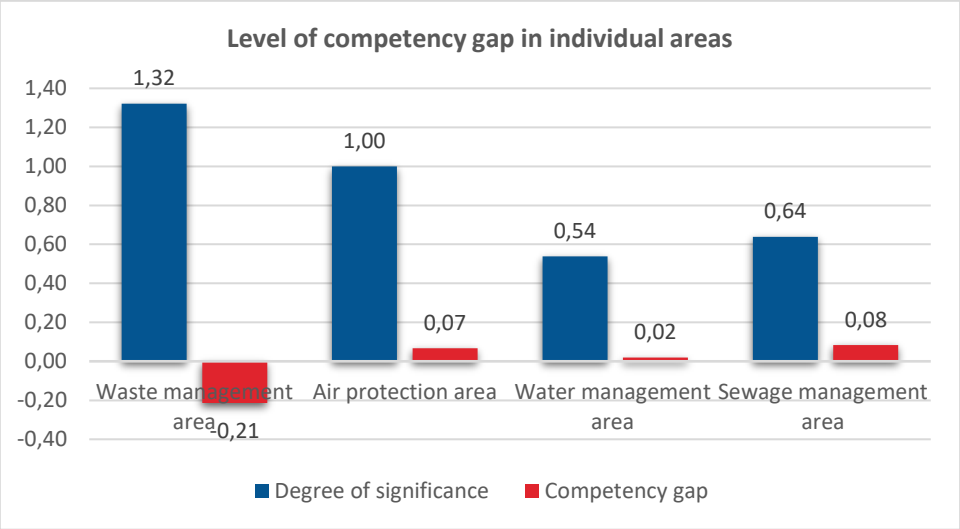
Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

Within the identified areas, the surveyed entrepreneurs were asked to assess the degree of significance of particular competences related to environmental economy from the point of view of the specificity of their company's operations, on a scale from 0 to 3 (where 0 means that this type of competence does not apply to the company, 1 – it is not important, 2 – it is important, 3 – it is very important) and on a similar scale, to assess the current state of competences possessed by employees (where 0 means lack of competences, 1 - low competences, 2 - medium competences, 3 - very high competences).

The questions concerning competence needs in particular areas 1) waste, 2) emission of gases and dusts into the air, 3) water consumption and sewage production were answered only by those companies which declared that they use a given environmental aspect.

First it should be noted that none of the discussed areas were considered by companies as requiring high competence needs or clearly deficient in terms of the current state of employees' knowledge (Figure 6). The competences in the area of waste management were the most significant, assessed at the level of 1.32. It is also in this case that the competence shortages of employees can be considered the greatest - at the level of -0.21. The second area in terms of significance was air protection (at the level of 1.00), however, in this case (as well as in the next one) the value of the competence gap was assessed positively, which means that the knowledge of employees is, according to the respondents, slightly higher than the demand of the companies.

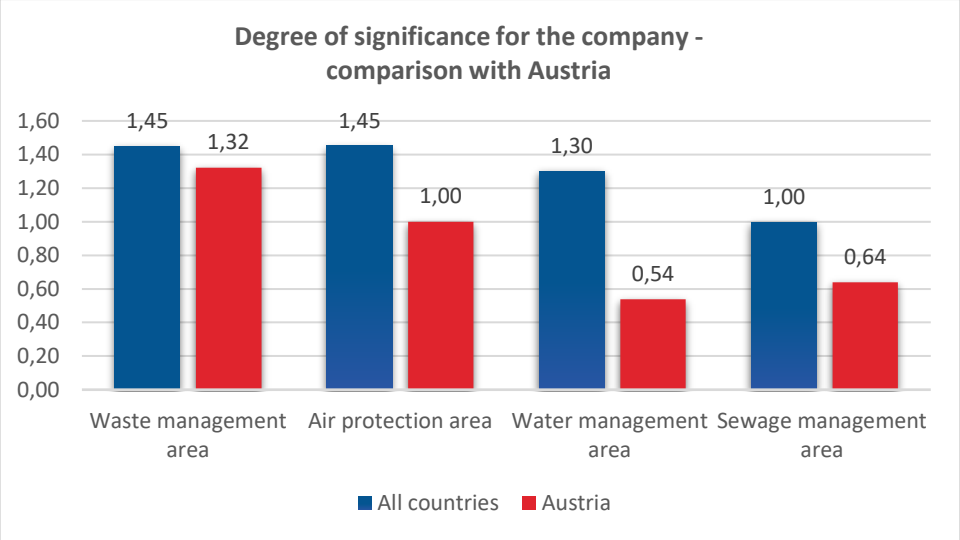
Figure 6: Level of competence gap in individual areas - Austria



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

A comparative analysis has been carried out on the basis of the aggregate research results and country-specific information. The average level of relevance of the competencies and the competency gap, which concerns all participating companies, was compared with the replies of Austrian companies. Figure 7 shows the level of relevance of the competences for all countries surveyed, compared to the results for Austria. For each of the areas, the relevance of competences in Austria is significantly lower. The difference is particularly large for water management, where the average significance for all countries was 1.30 and for Austria 0.54.

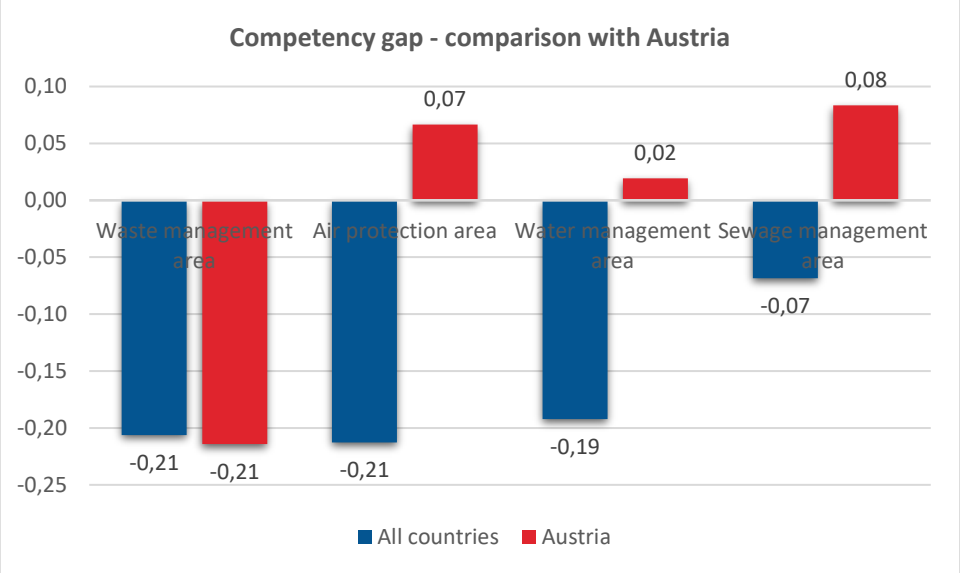
Figure 7: Level of relevance of competences – comparison with Austria



Source: Own study based on the findings of the survey, n=99; n – number of companies surveyed

Large differences between the collective opinion of companies and Austrian companies can be seen in relation to the competence gap. In the case of the three areas of air protection, water and sewage management, the competence gap in Austria is shown as positive, which means that the competence of employees is higher than employers' expectations (Figure 8). The results for all countries indicate negative gaps in the same areas. The exception is the competence deficits in the area of waste management - in both cases the competence gap was -0.21.

Figure 8: Level of competence gap in individual areas - comparison with Austria

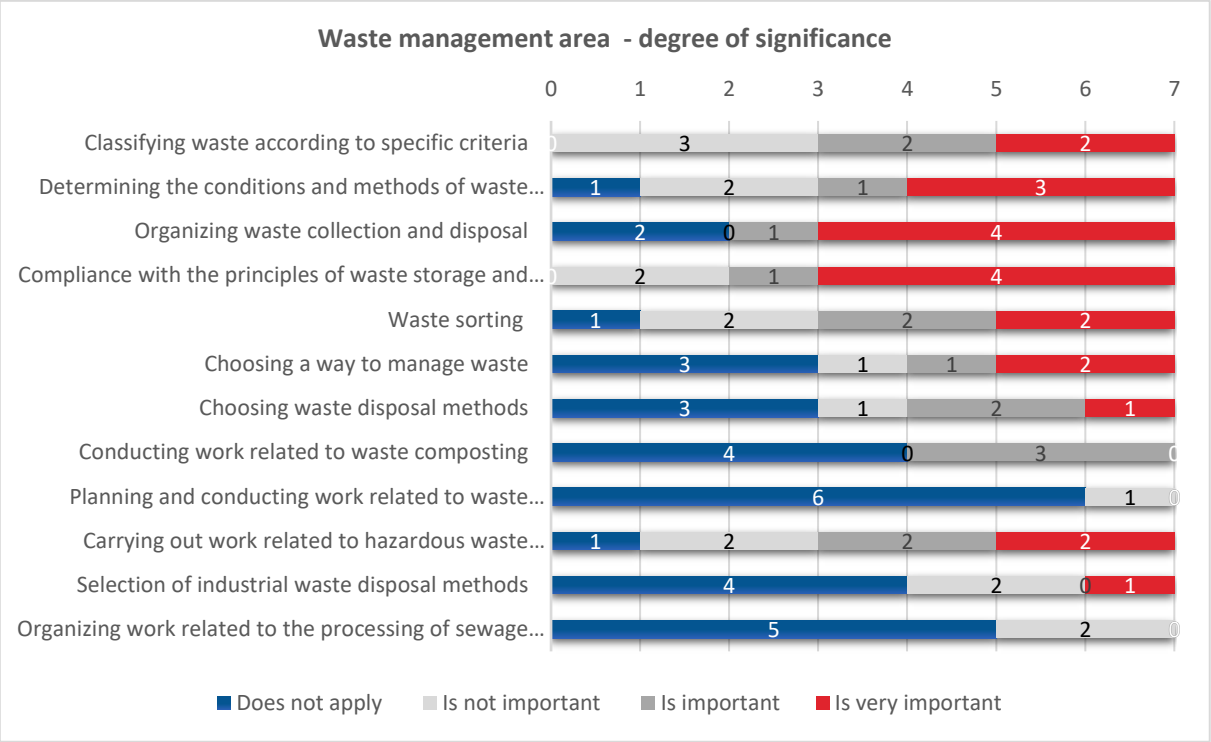


Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

3.1.1. Waste management area

In the most important and at the same time scarce area, which is waste management, two competences can be distinguished, assessed by 4 Austrian entrepreneurs surveyed as very important: Organising waste collection and disposal and Observing the rules of waste storage and disposal (Figure 9). The determination of conditions and methods of waste disposal was also high - 3. respondents assessed them as very important. Other competencies that more than half of the respondents described as important (2 companies) or very important (2 companies) are Classification of waste according to specific criteria, Waste sorting, Carrying out work related to the management of hazardous waste.

Figure 9: Level of relevance of waste management competences - Austria

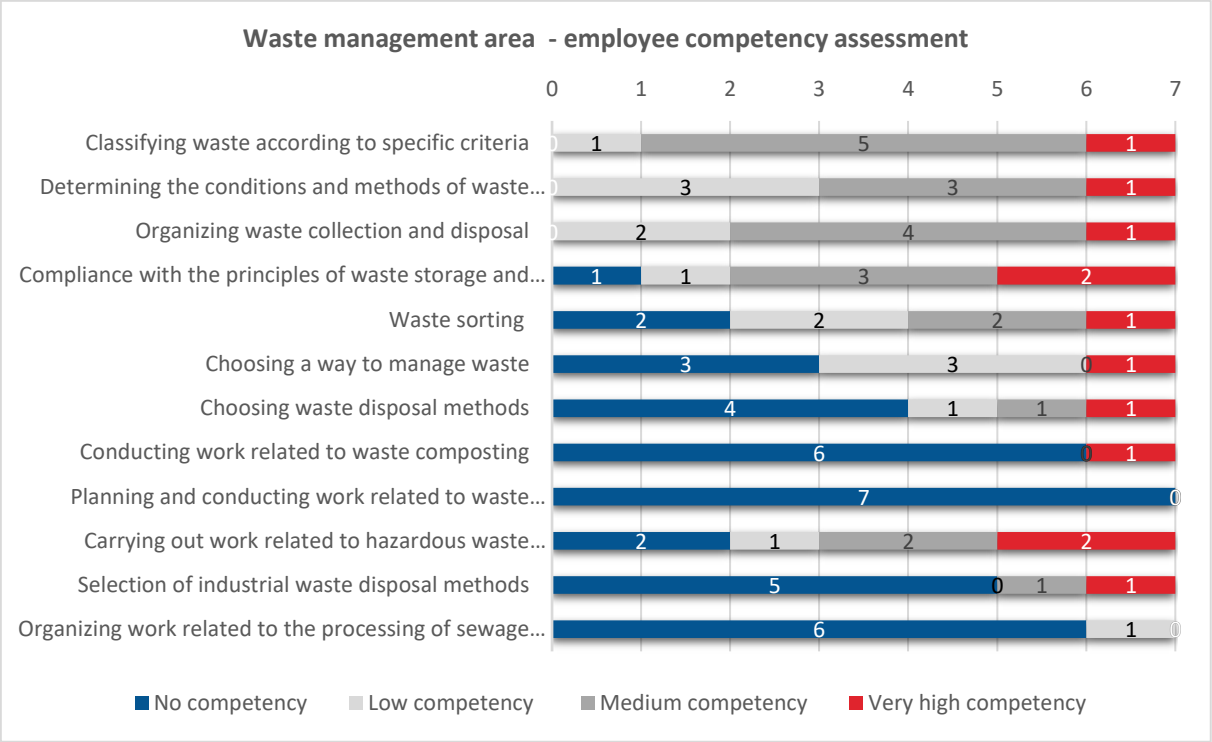


Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

In the area of waste management, the level of competence of employees varies greatly depending on the individual skills (Figure 10). Medium or high competences concern Classification of waste according to specific criteria (5 companies - medium competences, 1 company - very high competences), Organizing waste collection and disposal (4 companies - medium competences, 1 company - very high competences), Observing the rules of waste storage and storage (3 companies - medium competences, 2 companies - very high competences) Conducting works related to the management of hazardous waste (2 companies - medium competences, 2 companies - very high competences), Determining conditions and methods of waste disposal (3 companies - medium competences, 1 - very high competences).

Low or even lack of competence of the employees is reported by the employers in relation to: Planning and carrying out works related to waste incineration and operation of incineration plants (7 companies - lack of competence), Organizing works related to sewage sludge treatment and equipment operation (6 companies - lack of competence, 1 company - low competence), Carrying out works related to waste composting (6 companies - lack of competence, 1 company - low competence), Selecting the waste management method (3 companies - lack of competence, 3 companies - low competence).

Figure 10: Level of competence of employees in the field of waste management - Austria



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

Table 3 presents detailed data on the level of competence gaps in relation to waste management skills. As indicated by the data contained in the table, the largest competence gaps, understood as the difference between the level of materiality of the competence and the actual skills possessed by the employees, are revealed in the Compliance with the rules of waste storage and disposal, Waste Sorting and Waste Management Selection (competence gaps at level -0.43).

Table 3: Specific competence gaps in waste management - Austria

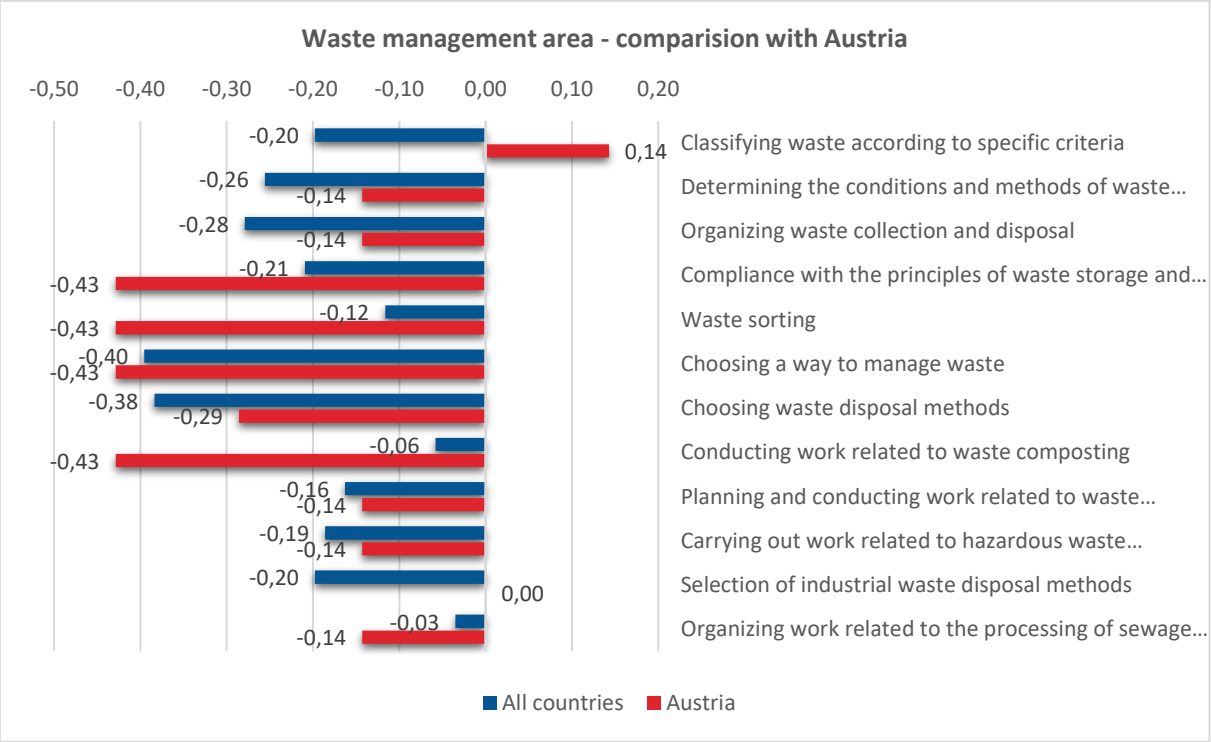
No.	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Waste management area	**1,32**	**1,11**	**-0,21**
1	Classifying waste according to specific criteria	1,86	2,00	0,14
2	Determining the conditions and methods of waste disposal	1,86	1,71	-0,14
3	Organizing waste collection and disposal	2,00	1,86	-0,14

4	Compliance with the principles of waste storage and storage	2,29	1,86	**-0,43**
5	Waste sorting	1,71	1,29	**-0,43**
6	Choosing a way to manage waste	1,29	0,86	**-0,43**
7	Choosing waste disposal methods	1,14	0,86	-0,29
8	Conducting work related to waste composting	0,86	0,43	-0,43
9	Planning and conducting work related to waste incineration and operation of incineration plants	0,14	0,00	-0,14
10	Carrying out work related to hazardous waste management	1,71	1,57	-0,14
11	Selection of industrial waste disposal methods	0,71	0,71	0,00
12	Organizing work related to the processing of sewage sludge and the operation of equipment	0,29	0,14	-0,14

Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

Figure 11 shows the level of competence gaps for all countries compared to deficits indicated by Austrian companies. The biggest differences concern the classification of waste according to specific criteria (gap at -0.20 - all countries, gap at 0.14 - Austria), the carrying out of composting works (gap at -0.06 - all countries), Gap at -0.43 - Austria), Waste sorting (gap at -0.12 - all countries, gap at -0.43 - Austria), Compliance with landfill and storage rules (gap at -0.21 - all countries, gap at -0.43 - Austria).

Figure 11: Specific competence gaps in waste management - comparison with Austria

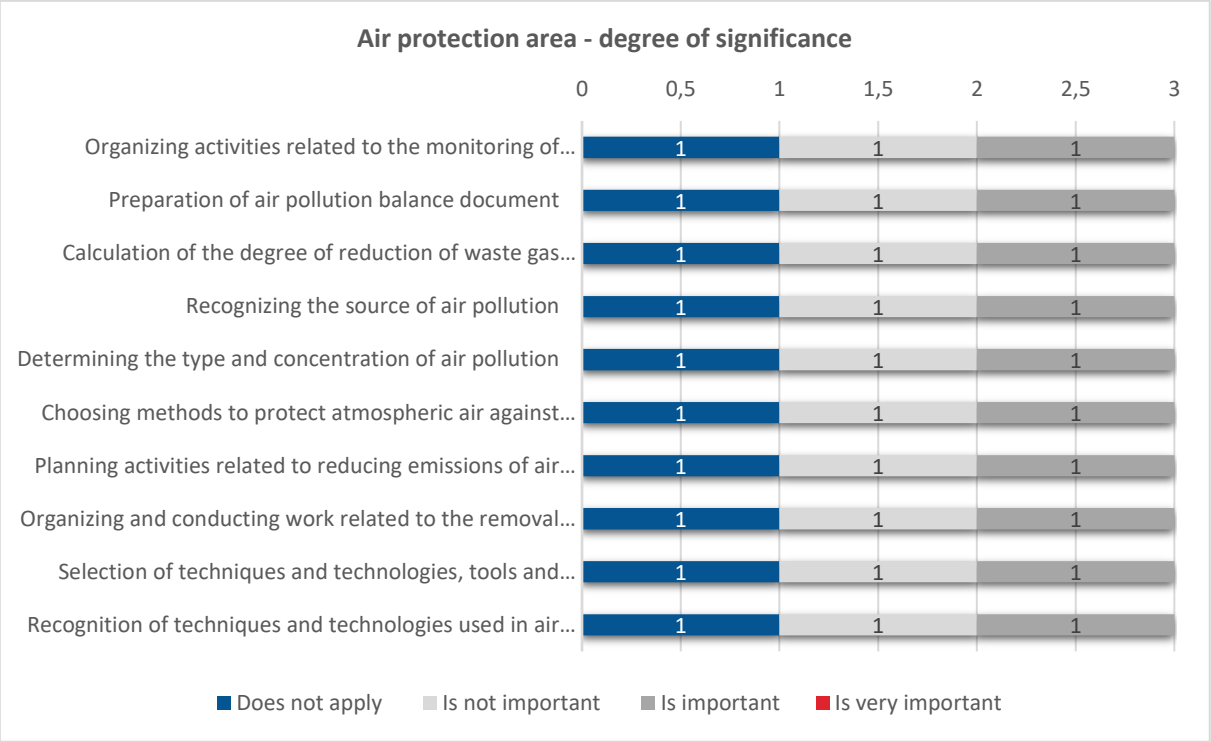


Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

3.1.2. The air protection area

In the area of air protection, the significance responses are similarly distributed within all competencies, which is also related to the low number of surveyed entities (3 companies). Entrepreneurs stated that the above mentioned skills do not concern their company or are of low importance for them - such an answer was provided by nearly 2/3 of the respondents (Figure 12). The small number of companies that referred to the issue of air protection in the study should be noted, ensuring that as a result of their activities no gas/dust emissions and thus no pollution occur in the area in question.

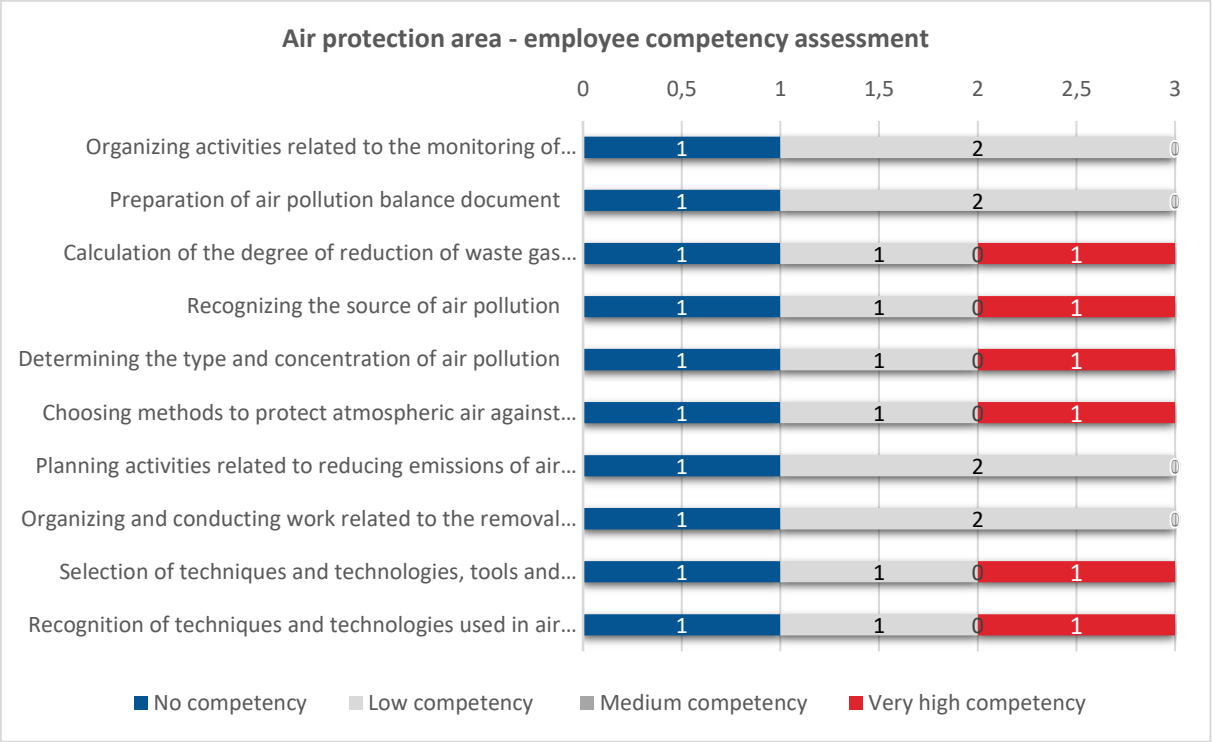
Figure 12: Level of relevance of competences in the field of air protection – Austria



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

Entrepreneurs when asked about the level of competence of their employees in the field of air protection, the least appreciated the skills associated with the organization of activities related to the monitoring of air pollution, preparation of air pollution balances, planning of activities related to the reduction of emissions of pollutants into the atmosphere, organization and conduct of works related to the removal of pollutants from the air (2 companies - low competence, 1 company - lack of competence) - Figure 13. The results obtained, however, are difficult to treat as representative due to the small sample.

Figure 13: Employees' level of competence in the field of air protection - Austria



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

Table 4 presents data on specific competence gaps in air protection skills. As the results show, the only competence gaps, at the level of -0.33, were related to the Organisation of activities related to the monitoring of atmospheric air pollution, preparation of air pollution balances, as well as the Planning of activities related to the reduction of emissions of pollutants into the atmosphere and the Organisation and Conduct of works related to the removal of pollutants from the air.

Table 4: Specific competence gaps in the field of air protection - Austria

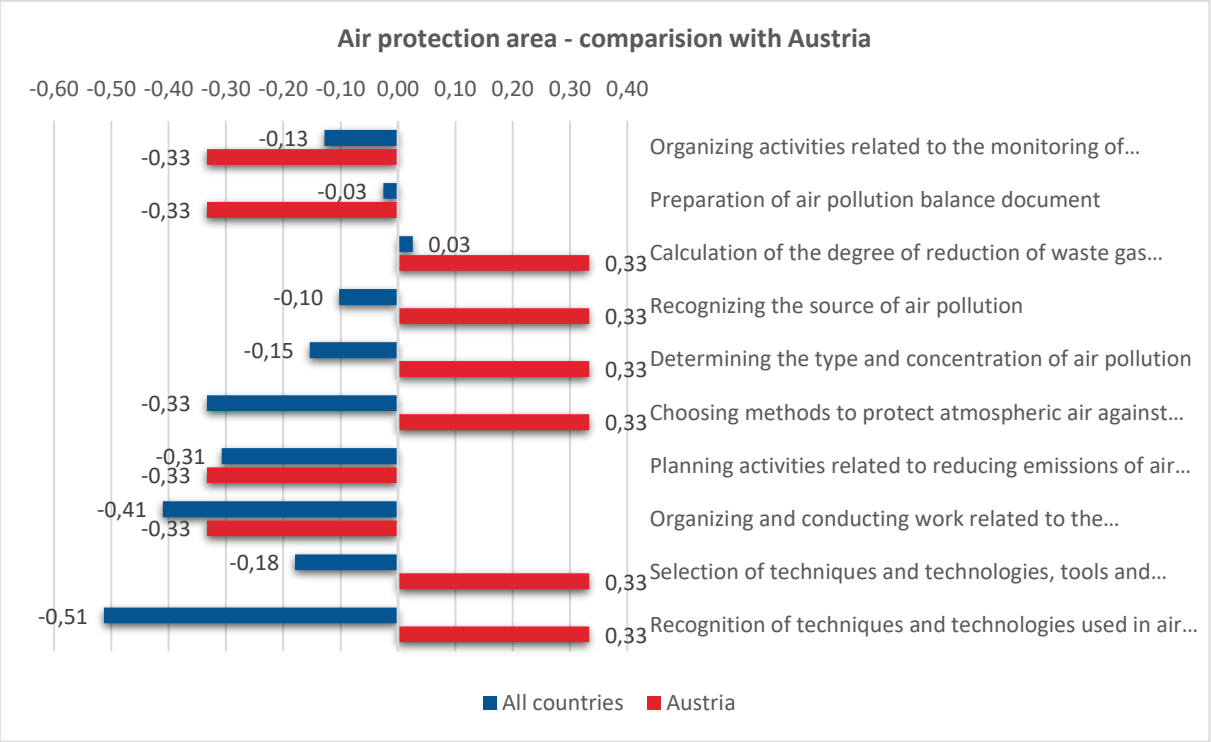
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Air protection area	**1,00**	**1,07**	**0,07**
1	Organizing activities related to the monitoring of atmospheric air pollution	1,00	0,67	**-0,33**
2	Preparation of air pollution balance document	1,00	0,67	**-0,33**
3	Calculation of the degree of reduction of waste gas impurities	1,00	1,33	0,33

4	Recognizing the source of air pollution	1,00	1,33	0,33
5	Determining the type and concentration of air pollution	1,00	1,33	0,33
6	Choosing methods to protect atmospheric air against pollution	1,00	1,33	0,33
7	Planning activities related to reducing emissions of air pollutants	1,00	0,67	**-0,33**
8	Organizing and conducting work related to the removal of atmospheric pollution	1,00	0,67	**-0,33**
9	Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions	1,00	1,33	0,33
10	Recognition of techniques and technologies used in air protection	1,00	1,33	0,33

Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

In the area of air protection, significant discrepancies can be observed between the level of competence gaps for all countries and those for Austria alone (Figure 14). In the case of Austria, a large part of the deficits have taken a positive form, which means that the competence level of employees exceeds employers' expectations. The biggest differences can be seen in the Recognition of techniques and technologies used in air protection (gap at the level of -0.51 - all countries, gap at the level of 0.33 - Austria), Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed pollutants and process conditions (gap at the level of -0.18 - all countries, gap at the level of 0,33 - Austria), Identification of techniques and technologies used in air protection (gap at -0.51 - all countries, gap at 0.33 - Austria), Determination of type and concentration of air pollutants (gap at -0.15 - all countries, gap at 0.33 - Austria), Identification of source of air pollutants (gap at -0.10 - all countries, gap at 0.33 - Austria).

Figure 14: Specific competence gaps in the field of air protection - comparison with Austria

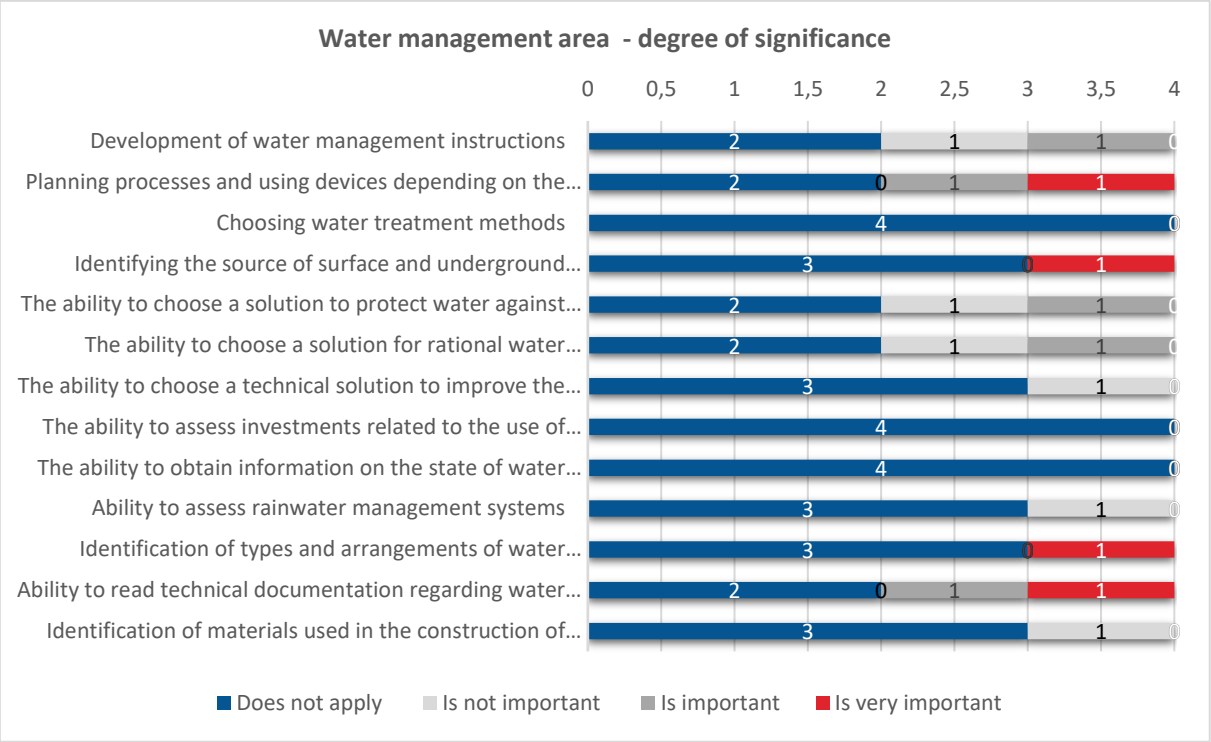


Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

3.1.3. Water management area

Little importance is also attributed to competences in the area of water management. Most of the competences were considered irrelevant or insignificant for the company. The only skills relevant for at least 2 of the 4 surveyed companies are Planning processes and equipment according to purpose and chemical composition and Ability to read technical documentation on water management (Figure 15). Individual answers indicating the high importance of the competence appear in relation to the Recognition of the source of surface and groundwater pollution and the Recognition of types and systems of water supply networks on the company premises.

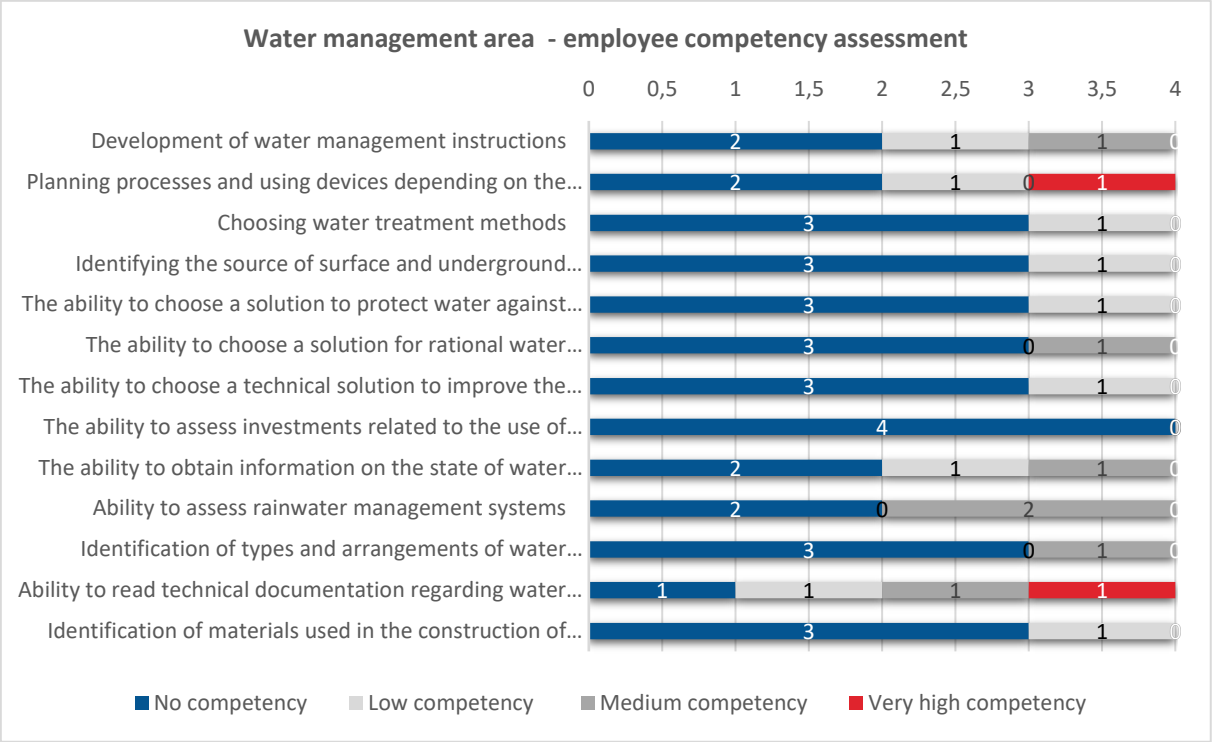
Figure 15: Level of relevance of competences in the field of water management – Austria



Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

The lowest level in the competences of the employees of the surveyed companies in the area of water management concerns the ability to assess investments related to the use of groundwater resources (all answers indicated a lack of competence in this area), Selection of water treatment methods (3 companies - lack of competence, 1 company - low competence), Identification of surface and groundwater pollution sources (3 companies - lack of competence, 1 company - low competence), Ability to select a solution for the protection of water against secondary contamination (3 companies - lack of competence, 1 company - low competence), Ability to select a technical solution for the improvement of the quality of water intake (3 companies - lack of competence, 1 company - low competence), Identification of materials used for the construction of water supply systems (3 companies - lack of competence, 1 company - low competence) - Figure 16.

Figure 16: Level of competence of employees in the field of water management – Austria



Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

The results of the conducted research indicate that the largest competence gaps in the area of water management concern the identification of the source of surface and groundwater contamination and the ability to select a solution for water protection against secondary contamination (Table 5). These gaps turned out to be rather small - both at -0.50.

Table 5: Specific competence gaps in water management - Austria

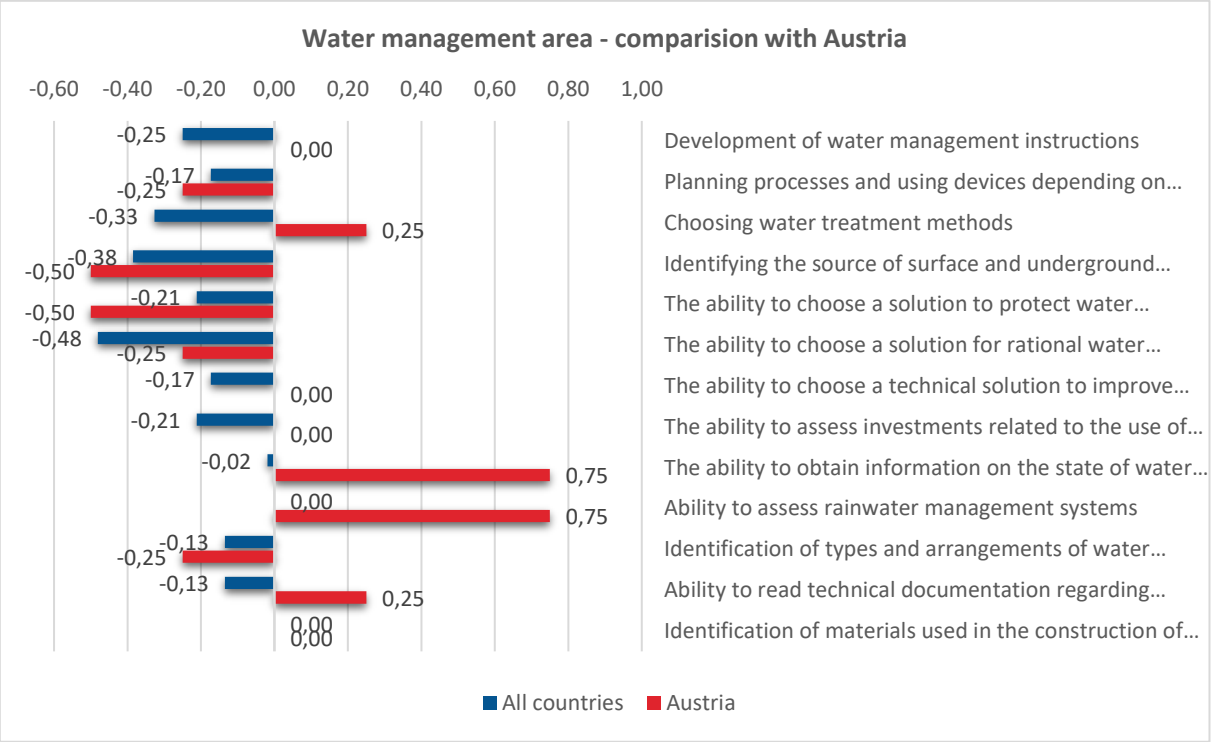
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Water management area	**0,54**	**0,56**	**0,02**
1	Development of water management instructions	0,75	0,75	0,00
2	Planning processes and using devices depending on the purpose and chemical composition	1,25	1,00	-0,25
3	Choosing water treatment methods	0,00	0,25	0,25

4	Identifying the source of surface and underground water pollution	0,75	0,25	**-0,50**
5	The ability to choose a solution to protect water against secondary pollution	0,75	0,25	**-0,50**
6	The ability to choose a solution for rational water consumption	0,75	0,50	-0,25
7	The ability to choose a technical solution to improve the quality of captured water	0,25	0,25	0,00
8	The ability to assess investments related to the use of groundwater resources	0,00	0,00	0,00
9	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes	0,00	0,75	0,75
10	Ability to assess rainwater management systems	0,25	1,00	0,75
11	Identification of types and arrangements of water supply networks on the company's premises	0,75	0,50	-0,25
12	Ability to read technical documentation regarding water management	1,25	1,50	0,25
13	Identification of materials used in the construction of plumbing	0,25	0,25	0,00

Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

A comparison of the aggregate competence gaps for all countries with those indicated by the Austrian companies shows that the biggest discrepancies concern the Skills to obtain information about the state of water resources, available types of surface and groundwater, types of water intakes (competence gap at -0.02 - all countries, competence gap at 0.75 - Austria) and Skills to assess rainwater management systems (competence gap at 0.00 - all countries, competence gap at 0.75 - Austria) - Figure 17.

Figure 17: Specific competence gaps in water management - comparison with Austria

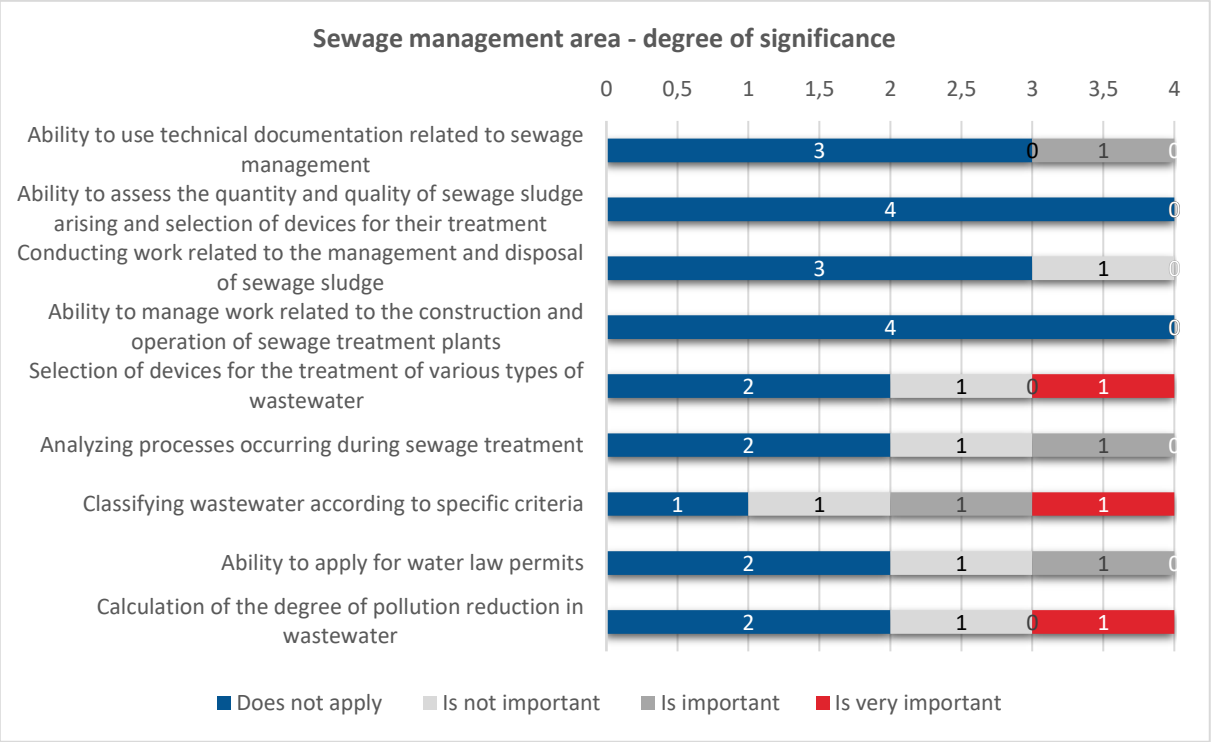


Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

3.1.4. Sewage management area

The majority of competences in the area of sewage management were considered by the surveyed entrepreneurs to be irrelevant or insignificant (Figure 18). Half of the respondents considered the classification of sewage according to certain criteria as an important or very important skill. Individual voices indicating that the competence is very important also appeared in the framework of the Selection of facilities for the treatment of various types of sewage and the Calculation of the degree of pollution reduction in sewage.

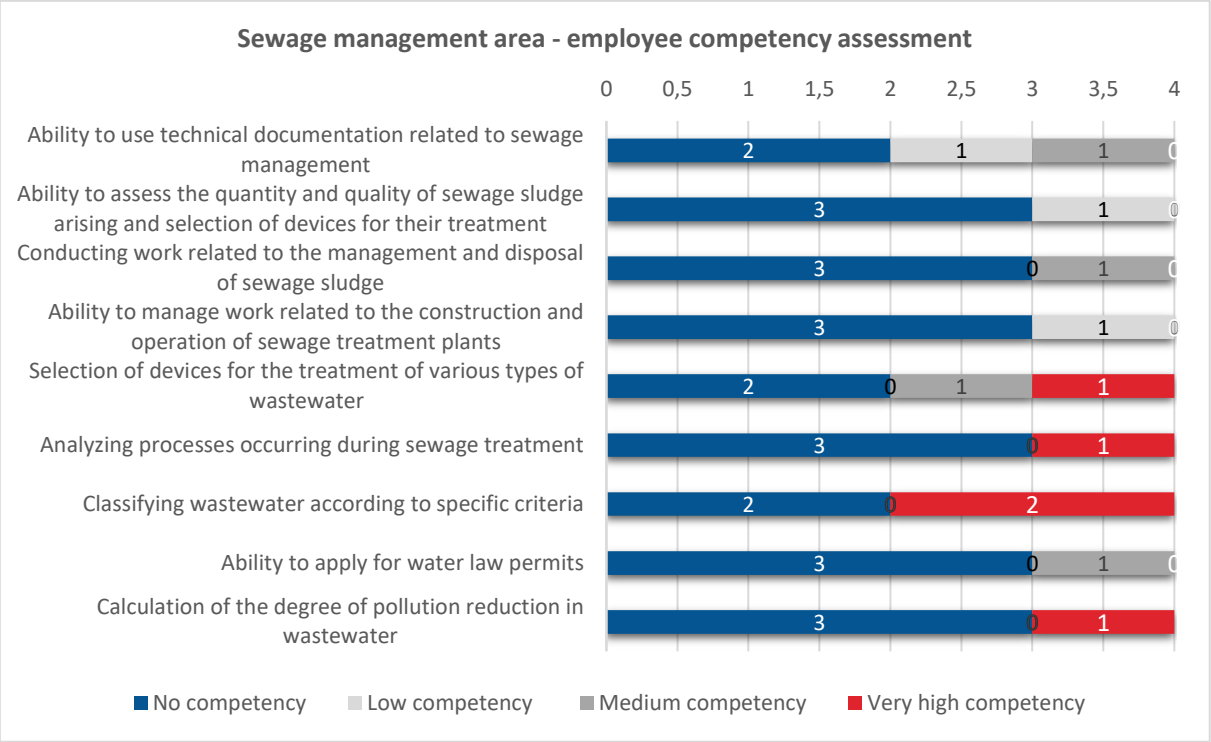
Figure 18: Level of relevance of competences in the field of wastewater management – Austria



Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

In the case of all the listed sewage management competences, at least half of the respondents indicated that employees lack competence in this area (Figure 19). The highest number of answers indicating the lack or low competence of employees appeared in the Ability to assess the quantity and quality of sewage sludge generated, selection of sewage treatment facilities (3 answers - lack of competence, 1 answer - low competence), Ability to manage works related to construction and operation of sewage treatment plants (3 answers - lack of competence, 1 answer - low competence). Also, conducting works related to sewage sludge management and disposal (3 answers - lack of competence), Ability to apply for water permits (3 answers - lack of competence), Calculating the degree of pollution reduction in sewage (3 answers - lack of competence) and Ability to use technical documentation related to sewage management (2 answers - lack of competence, 1 answer - low competence) were assessed as unfavourable.

Figure 19: Employees' level of competence in the field of wastewater management – Austria



Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

In the area of wastewater management, there are no high level of competence gaps. The only competence gaps that emerged concerned the ability to apply for water permits and to calculate the degree of pollution reduction in sewage. Both gaps were at -0.25 (Table 6).

Table 6: Specific competence gaps in sewage management - Austria

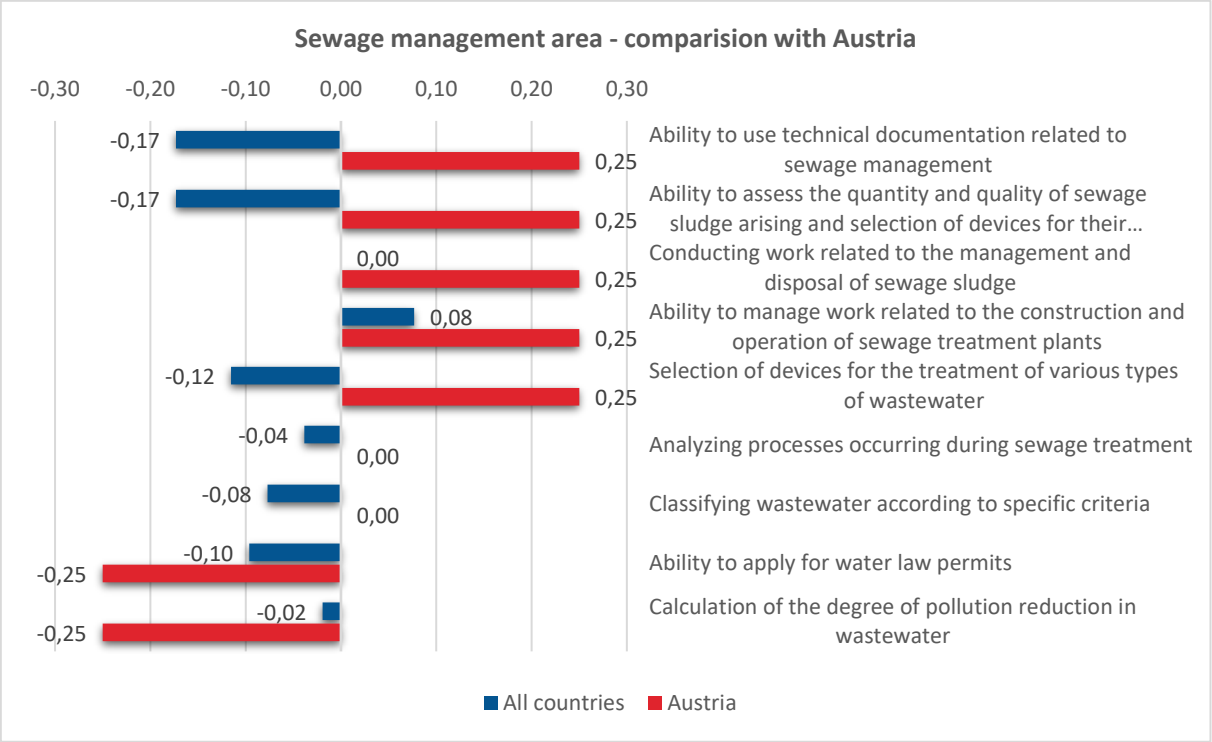
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Sewage management area	**0,64**	**0,72**	**0,08**
1	Ability to use technical documentation related to sewage management	0,50	0,75	0,25
2	Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment	0,00	0,25	0,25
3	Conducting work related to the management and disposal of sewage sludge	0,25	0,50	0,25

4	Ability to manage work related to the construction and operation of sewage treatment plants	0,00	0,25	0,25
5	Selection of devices for the treatment of various types of wastewater	1,00	1,25	0,25
6	Analyzing processes occurring during sewage treatment	0,75	0,75	0,00
7	Classifying wastewater according to specific criteria	1,50	1,50	0,00
8	Ability to apply for water law permits	0,75	0,50	**-0,25**
9	Calculation of the degree of pollution reduction in wastewater	1,00	0,75	**-0,25**

Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

A comparison of the average level of specific competence gaps for all countries and for Austrian companies shows that the biggest differences appear in the ability to use technical documentation related to wastewater management (gap at -0.17 - all countries, gap at 0.25 - Austria), Ability to assess the quantity and quality of sewage sludge generated, to select facilities for sludge treatment (gap at -0.17 - all countries, gap at 0.25 - Austria) and to select facilities for treatment of different types of sewage (gap at -0.12 - all countries, gap at 0.25 - Austria) - Figure 20.

Figure 20: Specific competence gaps in sewage management - comparison with Austria



Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

3.2. Experts' opinions on environmental management needs

The next stage of the study was qualitative interviews with experts in environmental management. In Austria, two experts were interviewed and asked questions about cost optimisation in the field of environmental management, training in environmental management, the use of renewable energy sources and competence needs in environmental management.

3.2.1. Optimisation of environmental management costs in SME enterprises

The experts were asked about the importance of **cost optimization in the field of environmental management in enterprises of the SME sector**. As the first expert stated: *Cost optimization is always important, not only in environmental management, but especially in the SME sector. It is necessary to optimise the costs of environmental management in SMEs in general and especially in areas where they are already involved, e.g. if they already consume electricity, cost optimisation in this area makes more sense than trying to optimise it in a less involved sector, e.g. waste, if this sector is not significant for the company* [1EA][21]. Also the second

[21] The part of the report devoted to the analysis of qualitative interviews uses quotations from the interviews which are marked with designations corresponding to the number of the expert interview (e.g. 1E) and a short description of the country of origin (e.g. A - Austria). For example, 1EA means that the quote comes from the first interview with the expert from Austria.

participant noted that *cost optimisation is an important aspect and the main incentive for better environmental management* [2EA].

It is worth commenting on these statements in the light of the results of the survey of companies that do not yet feel much pressure in Austria to optimise their environmental management costs, apart from energy costs. It may be noted that experts' statements herald the growing importance of cost optimization in the field of environmental management in SME sector companies in the future.

The second question in the qualitative study concerned **aspects of the green economy (e.g. electricity, waste, water, wastewater, heating), which should be the focus when planning educational programmes for SMEs.** In the opinion of the participating expert, *it is very difficult to determine on which sectors to focus, as all sectors concerning the environment, or rather the green economy, should be included. The focus should be on resource management, environmental law in all applicable areas, ecosystem services and environmental systems and their complexity and interconnection, as well as electricity, waste, wastewater, sewerage, heating, renewables, fossil fuels, economic dependency, etc. This really depends on the specific thematic area on which SMEs focus when planning educational programmes for SMEs. A plumber probably needs less knowledge of environmental economics than wastewater, heating, renewable energy sources, etc.* [1EA].

There was also a voice that waste is an aspect to focus on in particular: *Particular attention should be paid to the issue of waste, in particular to waste prevention, which has so far received little attention. At the same time, consistent waste avoidance saves costs for SMEs in particular, which is almost always underestimated. This means many small, unspectacular individual measures at all operational levels, the economic importance of which can only be seen in total. The introduction of waste prevention measures usually involves low costs* [2EA].

Summarizing statements of Austrian experts on educational needs of SME in the context of environmental management, it has to be stated that the spectrum of these needs is very broad, yet the specificity of particular companies operating in particular industries has to be taken into account. The subject which should be particularly useful is waste management. Such opinion fully confirms the results of the survey of enterprises.

3.2.2. Renewable energy sources

Another area raised was **the importance of using renewable energy sources (RES)** in the SME sector. As one of the interlocutors noted, *it is very important for the SME sector to use renewable energy sources. However, in most cases, when we only talk about such use, it depends first of all on the location of the SME and then on the national regulations, as well as on the availability, if the SME generally has the possibility to use RES* [1EA].

Questions were also examined whether and if so, to what extent **training in renewable energy sources (RES) for SMEs** should be promoted (e.g. solar modules, heat pumps, solar collectors, biomass boilers). The general opinion on RES training was similar among both respondents. In their opinion *it is important to use RES in the SME sector and promote training in this area* [2EA]. A similar opinion was presented by the second expert, saying that *training for SMEs should be strongly promoted, especially in SMEs that either work with any RES (e.g. installation of solar panels, etc.) or have the possibility to use RES (e.g. rural areas, sufficient space for e.g. a*

heat pump). Moreover, there is a need to promote RES to a certain extent in order to spread knowledge about it, even if the SME cannot use it immediately [2EA].

Therefore, training on RES is needed for SMEs, but on the one hand it should be adapted to their specific conditions. On the other hand, they can and should constitute a certain form of RES promotion, even if the application of specific solutions cannot be immediately used by companies.

3.2.3. Assessing competence needs for environmental management

In the following part of the interview, experts were asked to assess **the specific competence needs related to environmental management in the SME sector.** They were supposed to consider which competences of SME employees in the field of waste management are important for the functioning of SME companies and which of them should be taken into account when planning educational programmes. First of all, the survey participants stressed the importance of waste management issues*: for legal and therefore financial reasons (at least in Austria), employee waste management competences are, if not crucial, at least very important. They should be taken into account when planning educational programmes, firstly because it is important to ensure that waste is separated according to the given guidelines and secondly because SMEs may be able to reduce costs by implementing an appropriate waste management system* [1EA]. Among the mentioned competences, which should be taken into account when planning educational programmes, were: *first of all, raising awareness about waste prevention and the need to avoid wasting resources. Secondly, raising awareness and practical skills in the use of raw materials in a closed circuit (from extraction through production to the end of product life)* [2EA]. In addition, issues such as national waste legislation, composting, classification of waste according to specific criteria, conditions and methods of waste disposal, compliance with landfill rules, choice of waste management and waste disposal methods should ultimately be taken into account in all educational programmes for SMEs. In the case of SMEs that are directly involved in waste, the content of the education should be further developed and should cover topics such as *planning and carrying out waste incineration work and operation of the incineration plant, as well as the use of energy generated from waste, etc.* [1EA]

The experts also considered which **competences of employees in the field of air protection** are important from the point of view of operation of companies from the SME sector and worth taking into account when planning educational programmes. As the first of the experts' opinion, *the subject of air protection is quite important. It may be very important for all SMEs, not necessarily only directly related to such activity. As indoor air pollution may cause many problems with OSH guidelines in all companies. Therefore, when planning educational programmes it is necessary to take into account such topics as types of air pollution, monitoring of air pollution, source of air pollution, type and concentration of air pollution, protective equipment and equipment against air pollution, reduction of air pollution. All should be designed to take into account air pollution both outside and inside. In addition, depending on the programme and the SME itself, various other topics should be considered, including the determination of the type/concentration of air pollution, emission reduction activities, the removal of air pollution, the choice of techniques and technologies, tools and materials for air purification depending on the characteristics of the pollutants to be removed and the process conditions, issues of legislation and guidance, health risks, etc.* [1EA].

Another issue was the specific **competences of employees in the field of water management** and their relevance to the functioning of SME companies and planning of educational programmes. *As water management in general is one of the most important topics of the future for many countries, as can already be seen around the world, the importance of water management and process planning should be stressed from the point of view of SMEs. This is also due to the fact that the price of water is likely to rise, so managing it sustainably not only brings obvious environmental but also economic benefits.*

It is important to design and select appropriate water treatment methods, identify the source of water pollution, obtain information on the condition and type of water resources, as well as future indicators related to development and pollution. If an SME is very much involved in water treatment in similar undertakings, the training topics should be: types of water intakes, assessment of different water management systems, identification, planning and distribution of water supply networks at different scales, reading technical documents and identification of materials used in water and sewage construction, the focus should be on knowledge and skills in using water saving technologies and methods, as well as water treatment technologies and methods [1EA] - noted the interview participant.

They were asked what **competences of employees in the field of wastewater management** are important for companies in the SME sector and planning educational programmes. There was a lack of clear opinions on the subject, but *the educational programmes should emphasise the general understanding of wastewater management. If a small or medium sized enterprise is involved in sewage management, the education should be deepened according to the above examples* [1EA] noticed the expert.

The last issue raised during the expert interviews was the **competence of employees in the field of recycling, circular economy and environmental management** taking into account their importance from the point of view of the functioning of companies from the SME sector and the creation of educational programmes. One of the experts surveyed was of the opinion that *general knowledge on environmental management from cradle to cradle, circular economy, national and international legislation on recycling is needed. Knowledge and skills in preparation, reuse as well as 5-rs techniques and methods (rejection, reduction, reuse, recycling, composting), general knowledge of system sciences and environmental relations, CSR principles, as well as environmental identification and management skills, including to some extent marketing activities and the way they contribute to how the environmental aspect is implemented, etc. [1EA]. In addition, sensitisation to recycling management with awareness of waste avoidance at all levels, where possible. Knowledge transfer and promotion of innovation in the provision/leasing, repair, modular products of new design concepts, etc. [1EA]. Knowledge and analysis of already existing recycling management implementations and promotion of new or innovative approaches based on it* [2EA].

The experts pointed to the great abundance of specific competence needs related to environmental management in the SME sector. These indications can be directly used to shape educational programmes for SMEs in Austria and other European countries.

3.3. Examples of good practice in environmental management

The last stage of the conducted analyses was desk research, i.e. study of existing data, which consisted in the analysis of texts and materials available on the Internet describing examples of good practices in green

education implemented in the country. Descriptions of examples of good practices implemented in Austria are presented below.

CYCLE CC - Competence Centre [22]

The European Erasmus+ CYCLE project is intended to provide a set of information and educational materials for trainers in general adult education to develop and expand their professional and teaching skills in the area of circular economy. The concept of circular economy is one of the many responses to the dire need for transforming the global economy into a sustainable model. Production economy and consumer attitudes are increasing its pressure on the environment/the planet's resources, with negative effects. However, the shift to a circular economy makes it necessary to rethink our skill sets or developing new abilities, competences and approaches. The issues of school education, vocational training, and continuous learning, as well as adult education (the key word is life-long education) play they key role in transferring the right skills for a circular economy. Inclusion of new competences for circular economy in adult education is aimed at making people active and responsible citizens and promoting more sustainable communities which are able to face the present and future social, economic, and environmental challenges. The CYCLE project ran for three years and concluded in September 2019. The partnership included organisations and experts from six EU countries (Spain, Belgium, Italy, Poland, Great Britain, and Austria). CYCLE Competence Centre (CYCLE CC) is a space where educators can find training and counselling tools supporting the implementation of circular economy topics in various areas of education. CYCLE CC consists of two elements:
CYCLE Competences - a pedagogic model developed under the project as the first attempt at defining a set of competences for circular economy in adult education. Following a brief analysis of experience relating to circular economy in adult education across six countries (Spain, Belgium, Italy, Poland, Great Britain, Austria), the report defined a set of key competences which are aimed at facilitating citizens a conscious transfer from linear to circular economy. The CYCLE competence model was developed in order to define the codependent areas between, on the one hand, main determinants of circular economy, and, on the other hand, models which define entrepreneurial competences.

CYCLE Resources - CYCLE Competence Centre offers various educational materials on circular economy, starting with MOOC, videos and infographics, through case studies and practical classes. It is the right place for adult trainers looking for educational materials in the area of circular economy and sustainable resource management. The Competence Centre is intended to provide adult trainers with useful instruments for disseminating skills and competences on circular economy. The educational materials include dedicated case studies and examples of good practices which serve as inspiration for educational projects, as well as help to establish contacts with other practitioners to exchange experience. Circular economy competences relate to those competences which are necessary for a sustainable future. From in-depth analyses of natural resources and assets to detailed understanding of social behaviours necessary for establishing a circular economy, which affect the communities, economies, and the natural environment. The idea focuses on two areas of

[22] http://cyclecc.eu

transformation in a circular economy: production and comsumption. There are various fields in terms of "green" skills*:*

- Subject competences, or skills related to job-oriented tasks.
- General interdisciplinary skills, or skills covering interdisciplinary areas which are necessary for every skill.
- Normative competences, or skills related to ideas and values which are also necessary for shifting to a circular economy.
- Competences which support minimising the consumption of products and materials to make them last for as long as possible ("minimising the cycle").
- Competences which help to ensure that products and materials provide lasting benefits ("Slowing down the cycle").
- Competences which support the reuse of products which reach the end of their life cycle to provide added value ("closing the loop")

The Project's portal contains information on the status of developing skill sets for circular economy in adult education across the partner countries: Austria, Belgium, Italy, Poland, Spain and Great Britain. Moreover, competences for circular economy are defined and described with appropriate "skills", necessary "knowledge", and related "attitudes". Finally, there are three steps for implementing a teaching model of including circular economy skills in adult education.

Austrian ECO-School model - Education for sustainable development (ECOLOG)[23]

ECOLOG is a key action programme and network for greening schools and education in terms of sustainable development, and was developed in 1996 by a team of Austrian teachers working on an international project, "The Environment and School Initiatives" (Posch 1999). As a nation-wide support system, its aim is to disseminate and include an environmental approach to the development of individual schools. FORUM Umweltbildung (School Education Forum) is the lead coordinator in partnership with the Austrian Federal Ministry of Education, Arts, and Culture and the Austrian Federal Ministry of Agriculture and Environment. Thanks to this cooperation the ECOLOG programme is balanced and is perceived as a bridge between ecological education and school development. ECOLOG is based the ENSI appriach: schools, or "ESD Schools" - area analysed in terms of their environmental, technical and social conditions. The results serve as the basis for objectives, tasks and/or specific actions and quality criteria to implement and evaluate. Students, as well as other school stakeholders are involved through participation, encouraging the cooperation of authorities, businesses, and other interested parties. The materials concern such areas as resource conservation (energy, water, etc.), reduction of emissions (i.e. waste, traffic), spatial configuration (from class to campus), learning culture (communication, organisational structure), promotion of health, and opening schools for the community. In all, over 400 students and 90,000 students are currently covered by the network. Many other

[23] Franz Rauch,, Günther Pfaffenwimmer, *Education for Sustainable Development in Austria: Networking for Innovation*

resources are available via the website, including teacher training seminars and bulletins. Special emphasis is placed on technical (re)orientation, vocational education and training in support of sustainable development and greening the economy. From 1992, numerous training courses were conducted covering environmental, health-related, and social aspects of sustainable development offered by the Austrian education and vocational training system, and school curricula were developed accordingly. Environmental education, promotion of health, citizenship education, gender equality are all integrated in teaching programmes ac cross-curricular principles. The expansion of the programme is made evident in the fact that 104 vocational schools (from a total of 690) joined the environmental schools network and received 34 National Environmental Performance Awards for schools and universities; two vocational middle schools compiled reports on sustainable development, covering projects and documented measures (Sustainable development in technical high schools (htl) Donaustadt, Vienna, Austria 2005, International Business College Hetzendorf 2009).

The results may be summarised as follows:

- At the school level, communication proved to be the central element for controlling the environmental orientation in order to reach the common ESD agreement, and was the prerequisite for all members of the school community to learn.
- School principals play a key role thanks to their "official" support of the project, for example by putting it on the agenda of the teacher conferences, or by publicly vocalising their support. Motivation is further increased by small measures (e.g. pictures, information boards); establishing contacts outside the schools (public relations and use of media) and providing incentives (e.g. by coordinating and negotiating financial support with the authorities responsible for school financing and maintenance).
- Support for the initiative from the ministry is also a motivating factor. The project's website serves as an important source of information (http://www.oekolog.at). Regular teacher training workshops giving them the time and space to meet people face to face and create a sense of identity

Ecological Education and Teacher ESD - ENITE network [24]

In response to the OECD reports for 1991 and 1992, teacher education became one of the focal points for ENSI. The Austrian contribution was the beginning of the ENITE network. ENITE is support network for teacher oriented development and educational initiatives. In its first stage (1997–2000), groups of lecturers, teachers and students across several teacher training institutions worked on a research project focusing on education of teachers on environmental matters. The initiatives studied under ENITE were required to contain at least one of the following components:

- Education strictly applies to environmental initiatives at schools (cooperation between teacher training organisations and schools);

[24] Franz Rauch, Günther Pfaffenwimmer, *Education for Sustainable Development in Austria: Networking for Innovation*

- Educational experience based on and depending from prior student experience. This entails active student participation in the development of the project's content and methodology (from problem definition to quality assessment);
- Learning is interdisciplinary and not fragmented;
- Learning includes a research component based on systematic reflection on the real-life teacher practices (functional research);
- The effects and changes of work culture and organisational structures are included in the process of acting and reflection (Rauch and Kreis 2003)

The results were published in two publications (Posch et al. 2000; Kyburz-Graber et al. 2003).

In the second phase (2000–2004), the research project started tie ENITE network initiative, which provided a platform for mutual exchange of experience and ideas in order to support the stability of existing initiatives and their expansion to other institutions involved in teacher training. From 2000 to 2004, FORUM Umweltbildung served as the base for the ENITE network. Scientific supervision was provided by Institute of Instructional and School Development in Klagenfurt. Since then, the network caused the creation of a university course which involved all of the network's partners.

The third stage (since 2004) has been focusing on the current outcomes of the ENITE network, which is the National Teacher Training Course, Innovations in teacher training, Education for sustainable development. Over the first two years from 2004, teacher trainers from university teacher training collages and universities were invited to work on issues related to sustainable development, developmental problems, and educational challenges. The course consists of three-week seminars and regional mentor meetings. The objective here is to improve pedagogical competences in research, studies and reflection on educational practices in teacher training across various school subjects, and implementing concepts of sustainable development in teacher training programmes. The course is evaluated by formative and aggregate self-evaluation with internal (questionnaires, feedback from participants) and external (interviews before and after the course) components. The second course (2007–2009) also included all pedagogical universities in Austria, such as the Austrian Competence Centre for Biology at the University of Vienna. In 2012 and 2013, the BINE course was successfully concluded, with a proposal for starting a third edition. The results of conducted evaluation indicated that the BINE courses provide the appropriate instructional and educational strategy for its participants, establishing meaningful concepts for sustainable development (SD) and ESD through research, reflection, and group exchange of knowledge, focused on specific examples. The challenge is to not oversimplify ESD and lose its potential, so that the recognised interconnections between the spheres of ecology, society, economy, culture and politics become clear and relevant

LIFE - DoppelPlus - Climate campaign for low income households [25]

This project is intended to contribute to climate protection. Its measures are aimed at low income households. Often ignored in climate protection efforts, such families are particularly exposed to the effects of climate change, as they spend a high portion of their income on energy and mobility. The main objective of the LIFE -

[25] https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5674

DoppelPlus project is to promote changes in the daily behaviour of low income families. Through active involvement of low income groups in climate protection, the project will also increase their living standards while reducing energy bills. The project will increase the knowledge of active involvement in climate protection and will allow low income households to take concrete steps. As various factors determine climate friendly attitudes, the project is intended for different stakeholders, such as energy companies and decision makers. Specific measures provided by the project include: distribution of a climate protection startup kits for low income families. The kits include resources for saving energy (such as LED lamps, multiple plugs) and emission reduction (bike repair kits); free consultations for low income households on easy and adjustable energy saving opportunities (electricity, hot water, heating), encouragement to use public transport, and consumption /shopping/diet advice. IT also includes communications on special offers, events, and sponsored meetings organised by energy and transportation companies, and public institutions. The expected outcomes include:

- Development of regional and national strategies for climate protection and energy conservation which will significantly contribute to the reduction of CO2 emissions;
- Organisation of 40 workshops enabling low income families to save energy, reduce their bills, and protect the climate. The workshops will be attended by more than 600 people and 1080 climate protection startup kits will be distributed;
- Training 60 consultants/volunteers to provide free consultations on climate protection and energy conservation at low income homes. The trained consultants will conduct a total of 3240 home visits;
- Organisation of seven workshops attended by a total of 210 stakeholders in energy, consulting, real estate, and politics;
- Raising awareness through comprehensive communication strategies, including a film about the project and compulsory communication activities within the LIFE project;
- Establishment of a stable, longterm partnership through the created networks

Successful implementation of the project may reduce energy consumption by a total of 1,112,670 kWh annually and decrease CO2 emissions by 358,512 tons per year.

GarbageToo (#MüllToo)[26]

#GarbageToo is a project intended for students to encourage them to be mindful, responsible and respectful towards nature and act sustainably. Student's competence will be developed, including abilities to deal with various types of waste, which will contribute to the protection of health and nature. The project acknowledges that today's young generations in the future will have to tackle health and environmental issues, waste management, leading to the creation of new types of professions. Respect for the environment leads to careful purchases of consumer goods as a result of resource shortages. This entails other issues, such as manufacturing conditions and environment contamination, as well as health problems related to pollution and its removal. The project's pathway leads through ethical and moral reasoning to ethical and moral action. Through the

[26]https://www.umweltbildung.at/uploads/tx_hetopublications/publikationen/pdf/Broschuere_Best_of_austria_2019_barrierefrei.pdf

participation in the project, the students will gain knowledge multiply it, contributing to fulfilling the project's objective, i.e. shifting from an irresponsible lifestyle to an ecological one. The subject of waste and environmental protection finds its place in all school subjects and is covered in all grades. Projects in biology and environmental studies, geography and economy (trade, exploitation, environmental issues), chemistry an physics (degradation, material properties), languages (specialistic terminology, culture), mathematics (calculations, statistics, graphs), music ("The Sound of Mull 2" film), visual education (computer furniture, design jewelry), theatre class ("2091" play), and crafts (butterfly meadows, tree houses and birdhouses), It and media (#MullToo website, garbage game). There are also other classroom ideas, such as no-waste cooking, cost effective shopping, visits to waste collection points and disposal plants, etc. #MullToo is a longterm plan and a constant educational feature organised by BG / BRG Bad Ischl. The project assumes that our consumer-oriented world is destroying nature, which leads to the destruction of our living space. The basic requisite for successful education which eliminates wastefulness is not a change of behaviour but rather a change of values and habits.

Green jobs for green girls[27]

"Green Jobs for Green Girls" is a series of workshops for students of grades five to nine intended to inspire future employees working in jobs oriented around environmental protection and MINT (mathematics, informatics, natural sciences, technology). The objective is to create green jobs for young women. During each workshop, job profiles are presented and discussed interactively with students, with a focus on environmental protection issues. The project features very professional games where the students can build their own solar wind turbine. The project also highlights the still existing matter of gender inequality at career selection, income levels, as well as access to science and technology, and focuses of balancing development, women's work, empowerment and mobilisation of young people.

Green Building Solutions[28]

The annual "Green Building Solutions" is a summer university attracting architecture students and specialists from all over the world who want to focus on environmental planning and support the use of such knowledge in their countries. The three week summer course at an MA level focuses on environmental, economic, technical and social aspects, contributing to sustainable designs and buildings. The last event focused on the theme and issue of "sustainable building concepts, urban planning, and technical implementation". After getting familiar with the objective and materials, the participants may use them in practice in their countries, taking into account the specific social context. The participants become multipliers and have the opportunity of inter-cultural exchange. The BMWFW organisation and the city of Vienna have supported the project for many years.

[27]https://www.umweltbildung.at/uploads/tx_hetopublications/publikationen/pdf/Broschuere_Best_of_austria_2019_barrierefrei.pdf

[28]Bildung Fürnachhaltige Entwicklung - Best of Austria. Die eingereichten Projekte 2019. Internet access: https://www.umweltbildung.at/uploads/tx_hetopublications/publikationen/pdf/Broschuere_Best_of_austria_2019_barrierefrei.pdf, [access: 17.03.2020]

The project also serves as a platform and basis for transferring knowledge and values, global cooperation, and creation of new and innovative ideas for a shared future.

BFKK competencies to work

WW&CE

Water, Waste & Circular Economy

Finland

Suomi

Co-funded by the Erasmus+ Programme of the European Union

HANSE-PARLAMENT
Network for Small and Medium Enterprises

WWW&CE

Finland

Research in Finland was conducted by the University of Applied Sciences in Pori. Six companies operating in Finland took part in the study. Five of them were microenterprises and only one was classified as medium-sized enterprises. The companies analysed belonged to the business services (including business services), real estate (2 companies), industry (2 companies), health care (1 company) and services, social and personal activities (1 company).). The chapter presents Finnish good practice in the development of green competencies: LIFE CIRCWASTE - Cooperation for better waste management in Finland; Green Building Council Finland.

Finland

Suomi

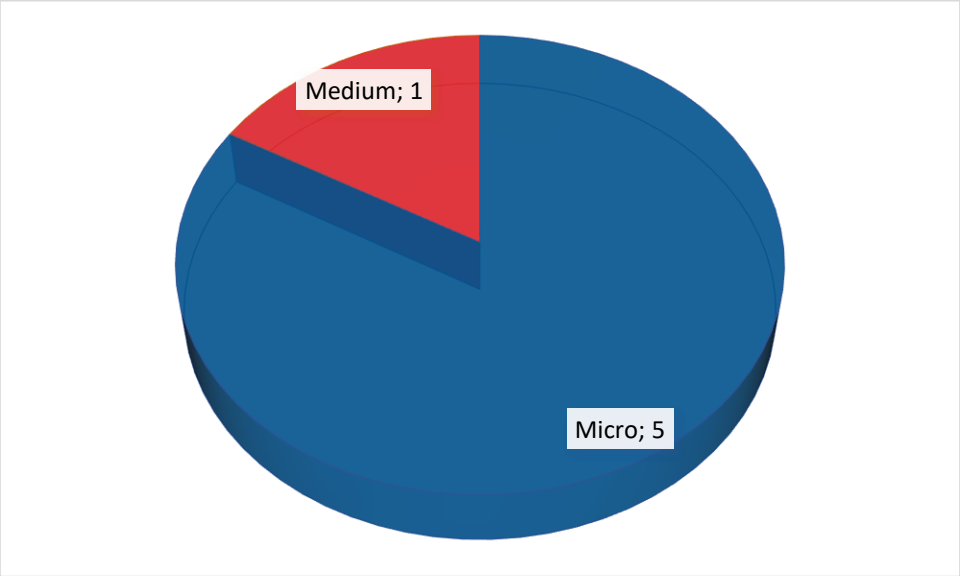
Co-funded by the Erasmus+ Programme of the European Union

4. Finland

4.1. Results of quantitative studies on environmental management needs

The survey involved 6 companies operating in Finland. Five of them were microenterprises and only one was classified as medium-sized enterprises (Figure 21).

Figure 21: Company size - Finland



Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

The companies analyzed belonged to the industry related to business services (including services for companies), real estate (2 companies), industry (2 companies), health care (1 company) and services, social and individual activities (1 company) - Figure 22.

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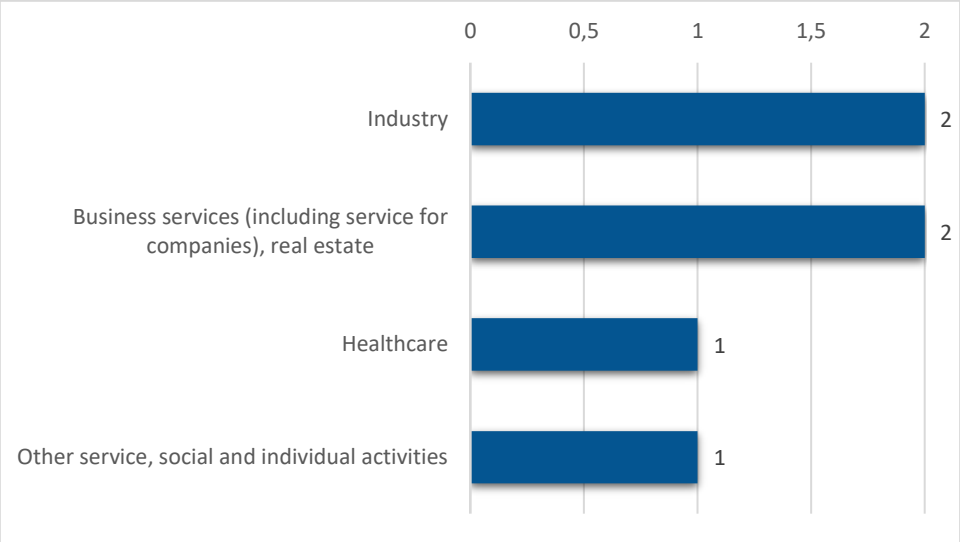
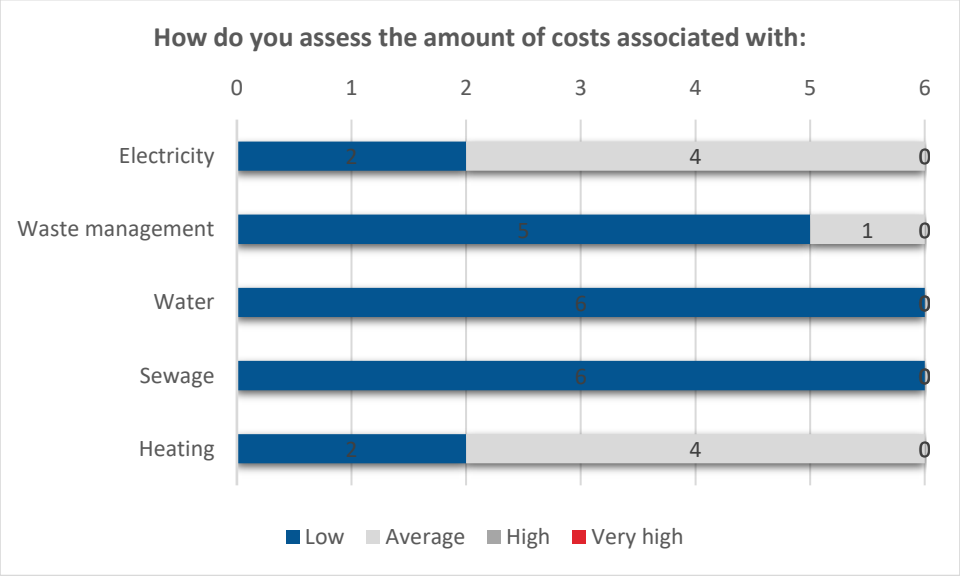
Figure 22: Main activity of the company - Finland



Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

Entrepreneurs were asked to assess the amount of costs related to electricity, waste, water, sewage and heating in relation to the total cost of the company (Figure 23). The answers concerning the areas of water, sewage and waste indicated low costs incurred in connection with their consumption or production. A similar position was taken with respect to electricity and heating, where 4 out of 6 companies indicated the average amount of costs incurred and the remaining 2 stated that these costs were low.

Figure 23: Costs incurred - Finland



Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

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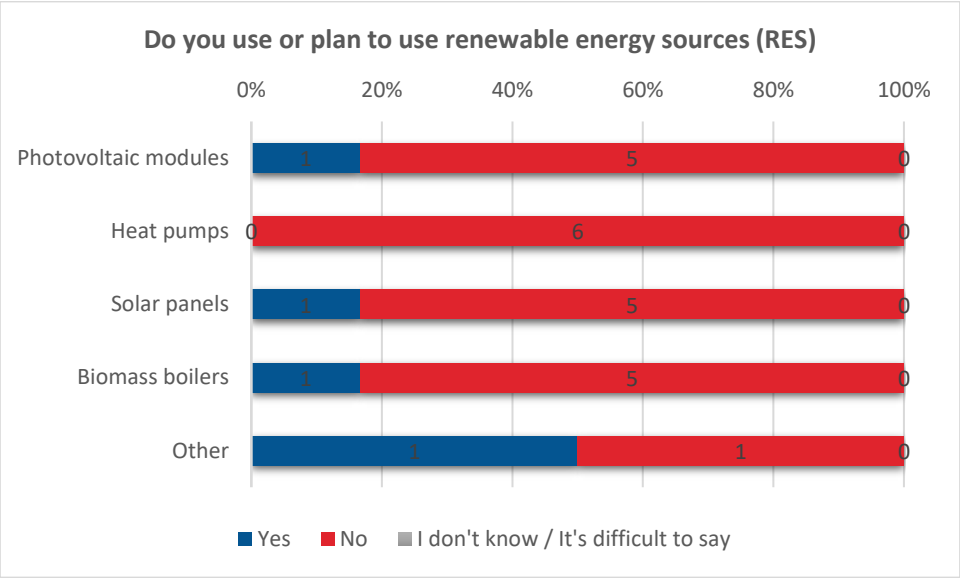
In response to the question about the use of renewable energy sources (RES) and their planned introduction in the future, the majority of entrepreneurs stated that RES are not and will not be used (Figure 24). Individual affirmative answers concerned photovoltaic modules, solar collectors and biomass boilers.

Figure 24: Use of renewable energy sources in companies - Finland



Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

A filtering question was used in the research questionnaire in order to identify possible types of pollution produced by the surveyed companies, which subsequently allowed to identify areas requiring detailed analysis in terms of competence needs in environmental management. On this basis, companies were identified that produce waste (all surveyed companies from Finland), emit gases and dust into the air (half of the companies), and use water and produce sewage (2 out of 6 surveyed companies) - Figure 25.

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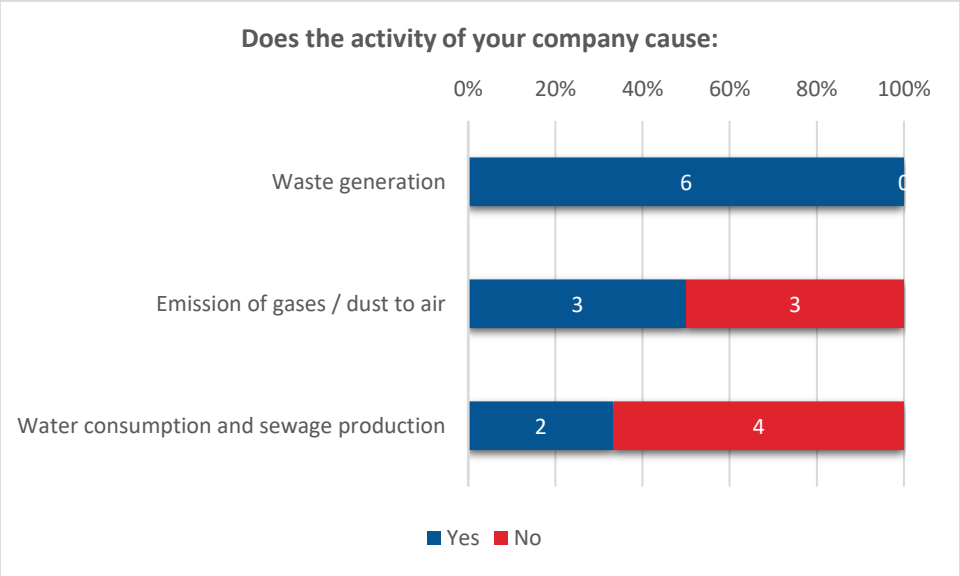
Figure 25: Types of pollution generated by companies in their business activity - Finland



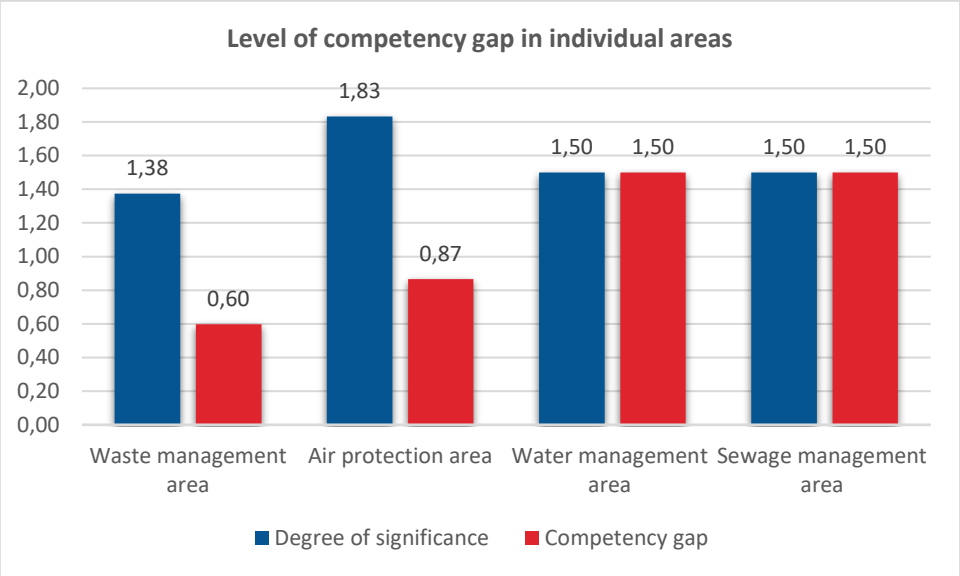
Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

Within the identified areas, the surveyed entrepreneurs were asked to assess the degree of significance of particular competences related to environmental economy from the point of view of the specificity of their company's operations, on a scale from 0 to 3 (where 0 means that a given competence does not concern their company, 1 - is not important, 2 - is important, 3 - is very important) and on a similar scale, to assess the current state of competences possessed by employees (where 0 means lack of competences, 1 - low competences, 2 - medium competences, 3 - very high competences).

For questions about competence needs in particular areas: 1) waste, 2) emission of gases and dusts into the air, 3) water consumption and sewage production, only those companies which declared that they use a given aspect of the environment.

Among the mentioned areas, the most important, in the opinion of employers, was the area of air protection, whose average significance reached the level of 1.83 (Figure 26). A slightly lower level of significance was recorded in the remaining areas - in the case of water and sewage management it was 1.50 and waste management 1.38. What is important, however, in the case of Finland none of the discussed areas was considered by companies to be in deficit in terms of the current state of knowledge of employees. Within all areas, the competence gap was assessed positively, which means that the knowledge of the employees is, in the opinion of the respondents, slightly higher than the companies' needs.

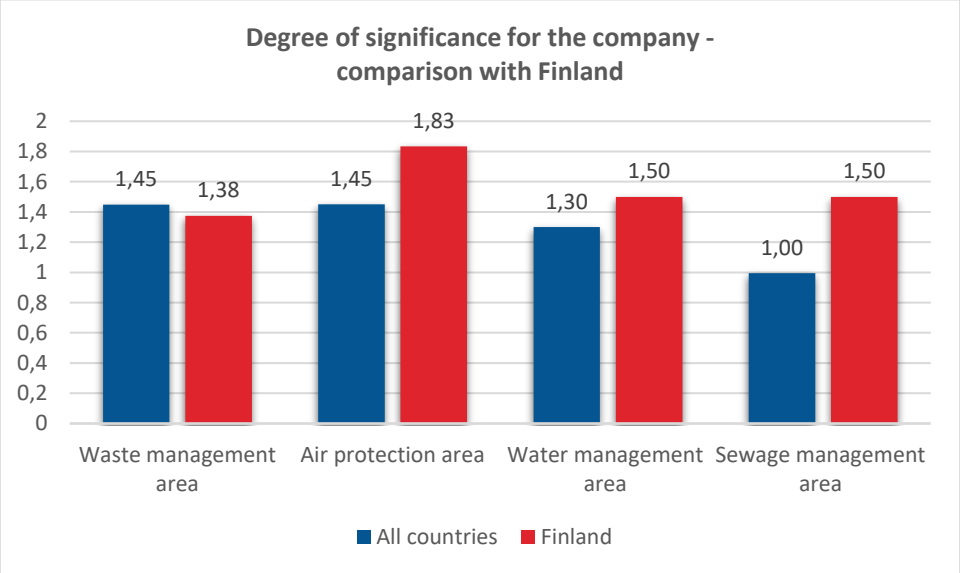
Figure 26: Level of competence gap in individual areas - Finland



Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

The biggest differences between the aggregate results for all countries and the relevance of competences presented by the Finnish companies are in the areas of wastewater management (average relevance for all countries - 1.00, relevance for Finland - 1.50) and air protection (aggregate performance - 1.45, Finland - 1.83). The smallest differences concern waste management (all countries with a significance of 1.45, Finland with a significance of -1.38) - Figure 27.

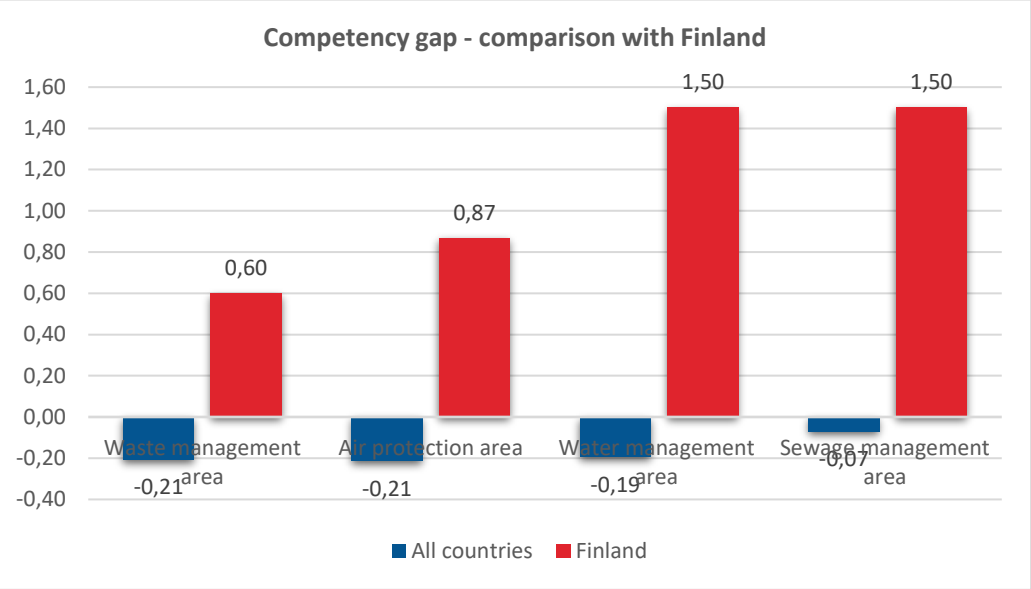
Figure 27: Level of relevance of competences - comparison with Finland



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

Larger differences are visible in the analysis of the competence deficits of employees. The data for Finland indicate that the competence gaps in all areas are positive - employee competences are higher than entrepreneurs' expectations (Figure 28). This is particularly evident in the water and wastewater areas, where gaps have reached 1.50. There are no positive gaps in the aggregate results.

Figure 28: Level of competence gap in individual areas - comparison with Finland

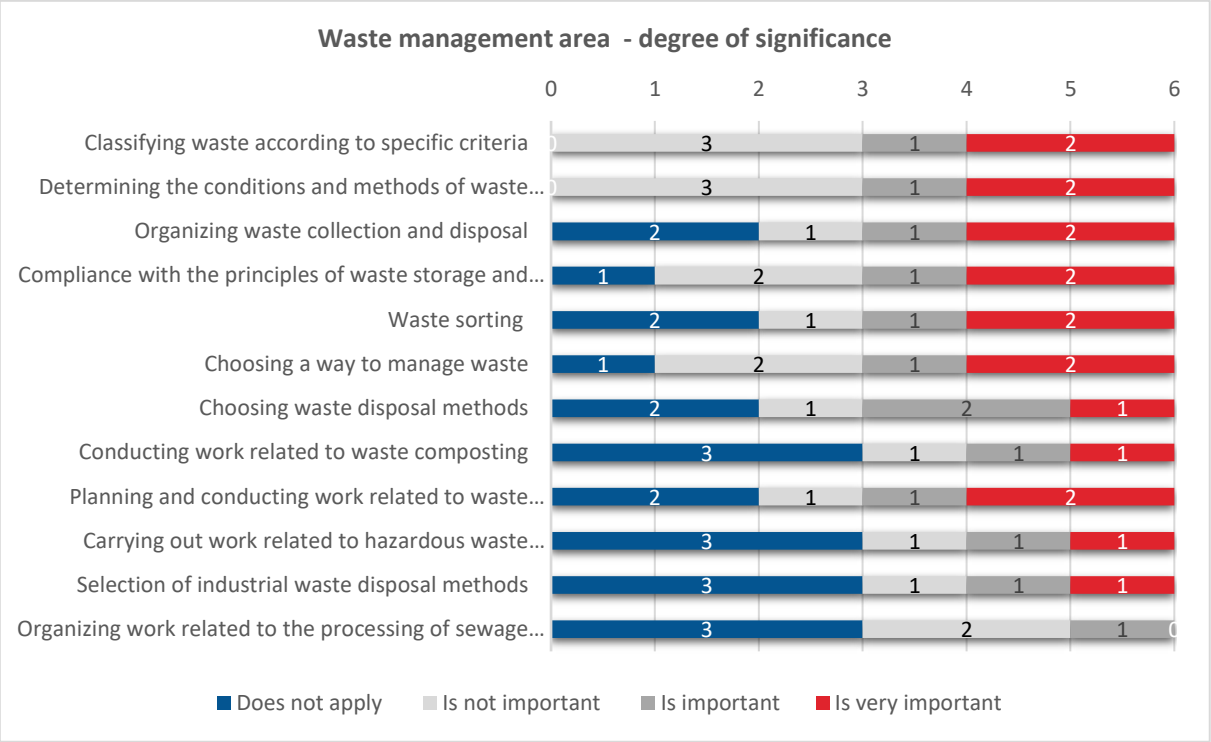


Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

4.1.1. Waste management area

In the area of waste management, none of the competencies has stood out as particularly important from the perspective of entrepreneurs. Among the skills which, in the opinion of half of the surveyed companies, are very important or relevant: Classification of waste according to specific criteria, Determination of conditions and methods of waste disposal, Organization of waste collection and disposal, Observing the principles of waste storage and warehousing, Waste sorting, Selection of waste management methods, Selection of waste disposal methods, Planning and carrying out work related to waste incineration and incineration plant operation. The competence that was considered the least important or not relevant to the company's operation was to organize work related to the processing of sewage sludge and operation of equipment (Figure 29).

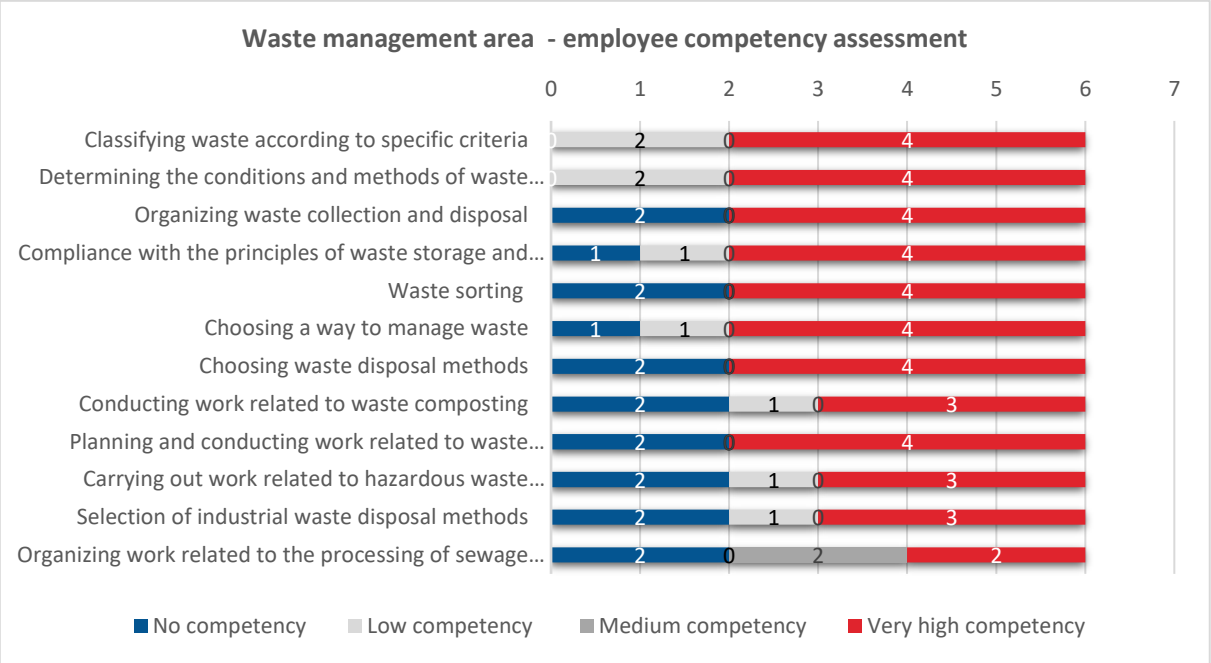
Figure 29: Level of relevance of waste management competences - Finland



Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

In the area of waste management, the level of competence of employees was rated rather high. With regard to most competences, more than half of entrepreneurs (4 out of 6 companies) assessed the skills of their employees as very high. The competence deficits among the employees were perceived by half of the companies as being in the skills: Carrying out works related to the composting of waste, Carrying out works related to the management of hazardous waste, Selecting methods of neutralising industrial waste (Figure 30).

Figure 30: Level of competence of employees in the field of waste management - Finland



Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

Table 7 presents detailed data on the level of competence gaps in relation to waste management skills. As indicated by the data contained in the table, the competences in the area of waste management are not in short supply in terms of the state of employees' knowledge compared to the relevance of the skills in question for companies. In all cases, the value of the competence gap was positive, which means that the knowledge of employees is, in the opinion of the respondents, higher than the demand of enterprises.

Table 7: Specific competence gaps in waste management - Finland

No	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Waste management area	**1,38**	**1,97**	**0,60**
1	Classifying waste according to specific criteria	1,83	2,33	0,50
2	Determining the conditions and methods of waste disposal	1,83	2,33	0,50
3	Organizing waste collection and disposal	1,50	2,00	0,50

4	Compliance with the principles of waste storage and storage	1,67	2,17	0,50
5	Waste sorting	1,50	2,00	0,50
6	Choosing a way to manage waste	1,67	2,17	0,50
7	Choosing waste disposal methods	1,33	2,00	0,67
8	Conducting work related to waste composting	1,00	1,67	0,67
9	Planning and conducting work related to waste incineration and operation of incineration plants	1,50	2,00	0,50
10	Carrying out work related to hazardous waste management	1,00	1,67	0,67
11	Selection of industrial waste disposal methods	1,00	1,67	0,67
12	Organizing work related to the processing of sewage sludge and the operation of equipment	0,67	1,67	1,00

Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

Large differences in the level of competence gaps appear in the comparison of overall performance from countries with Finland (Figure 31). First of all, in the case of Finland, the gaps in the area of waste management have taken a positive value, which means that the competence level of employees is higher than the needs of employers. The biggest differences can be seen in the Selection of waste disposal methods (gap at -0.38 - all countries, gap at 0.67 - Finland) and the Organisation of sludge treatment and equipment operation (gap at -0.03 - all countries, gap at 1.00 - Finland).

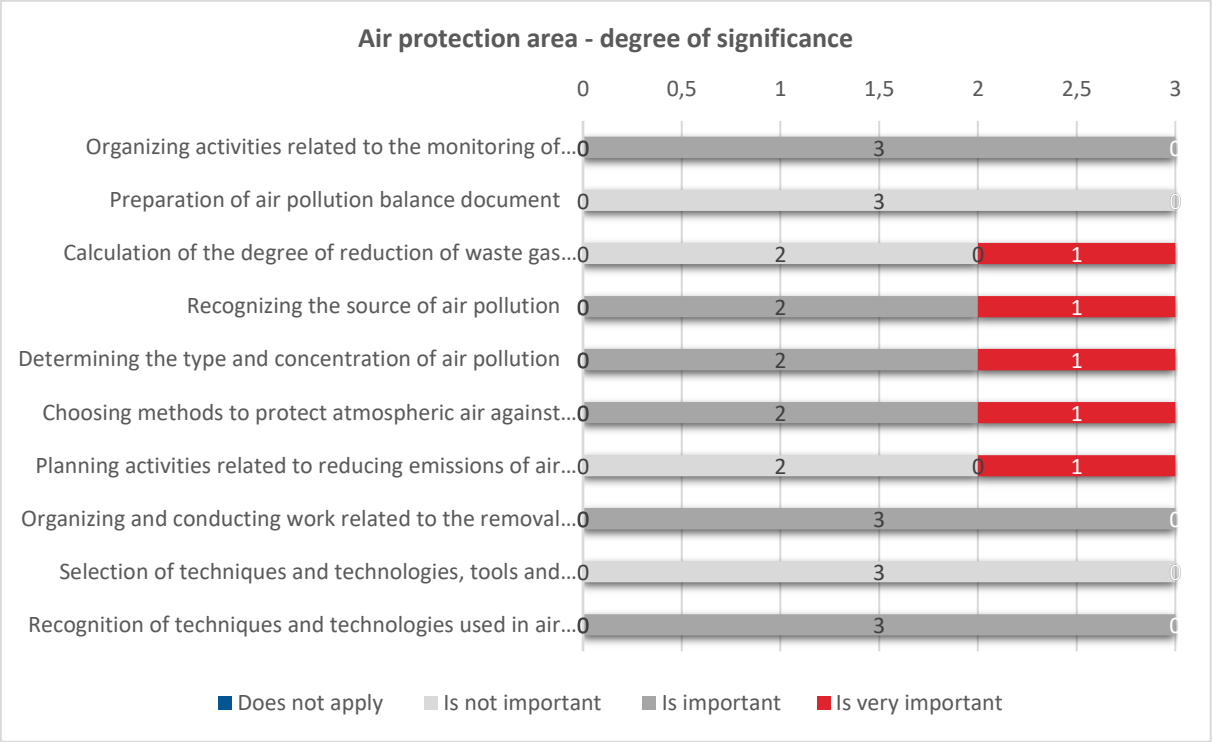
Figure 31: Specific competence gaps in waste management - comparison with Finland

Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

4.1.2. The air protection area

In the most relevant area of air protection for the Finnish companies surveyed, the responses to the significance were rather varied (Figure 32). All companies considered such competences as: Identification of the source of air pollution, Determination of the type and concentration of air pollution, Selection of methods of air protection against pollution, Organization of activities related to the monitoring of air pollution, Organization and performance of works related to the removal of pollutants from the air, Identification of techniques and technologies used in air protection. The preparation of air pollution balances and the selection of techniques and technologies, tools and materials for air purification depending on the properties of the removed pollutants and process conditions are of little importance to all the companies participating in the study.

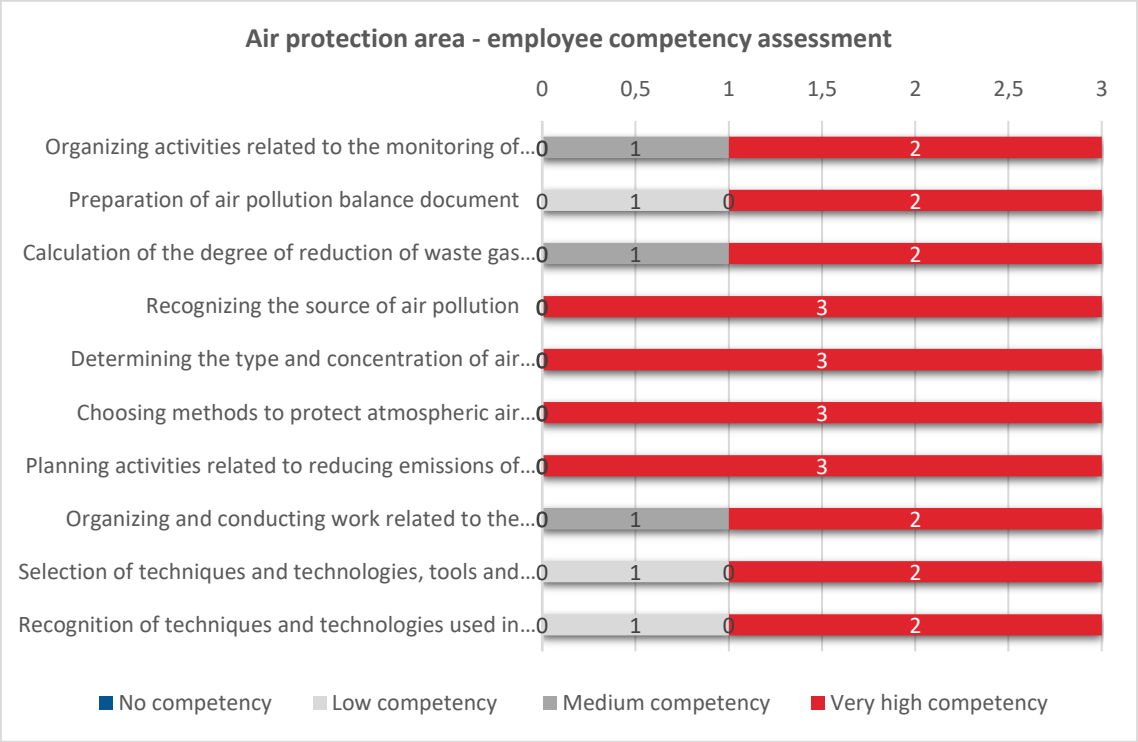
Figure 32: Level of relevance of competences in the field of air protection - Finland



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

Also in the case of the air protection area, most of the answers indicated very high or high competence of employees. They were rated the best: Identification of the source of air pollution, Determination of the type and concentration of air pollution, Selection of methods of air protection against pollution, Planning of action related to the reduction of emissions of pollutants into the atmosphere. Individual answers indicating the low level of competence were related to the preparation of air pollution balances, Selection of techniques and technologies, tools and materials for air purification depending on the properties of the removed pollutants and process conditions, as well as Identification of techniques and technologies used in air protection (Figure 33).

Figure 33: Employees' level of competence in the field of air protection - Finland



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

Table 8 presents data on specific competence gaps in air protection skills. The analysis indicates that there are no competence deficits among the competences in the area in question - all competence gaps are on a positive level, which means that the competences of employees exceed the expectations of employers.

Table 8: Specific competence gaps in the field of air protection - Finland

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Air protection area	**1,83**	**2,70**	**0,87**
1	Organizing activities related to the monitoring of atmospheric air pollution	2,00	2,67	0,67
2	Preparation of air pollution balance document	1,00	2,33	1,33
3	Calculation of the degree of reduction of waste gas impurities	1,67	2,67	1,00

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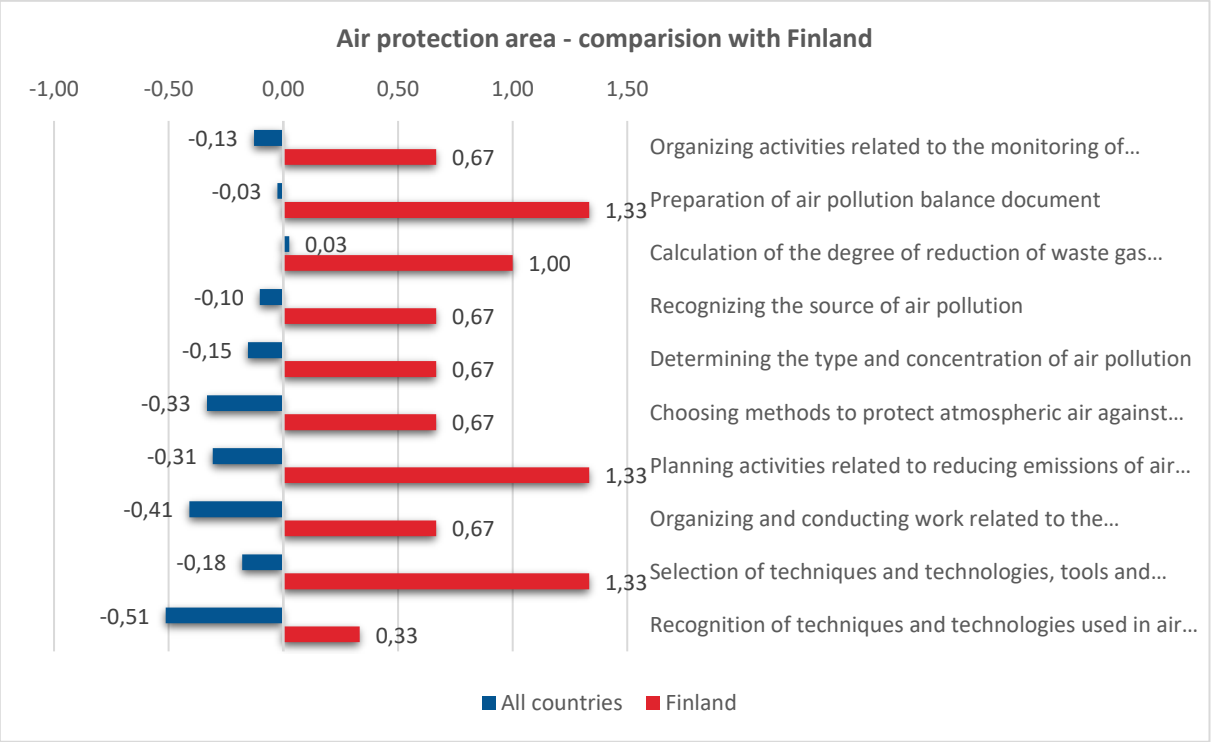
4	Recognizing the source of air pollution	2,33	3,00	0,67
5	Determining the type and concentration of air pollution	2,33	3,00	0,67
6	Choosing methods to protect atmospheric air against pollution	2,33	3,00	0,67
7	Planning activities related to reducing emissions of air pollutants	1,67	3,00	1,33
8	Organizing and conducting work related to the removal of atmospheric pollution	2,00	2,67	0,67
9	Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions	1,00	2,33	1,33
10	Recognition of techniques and technologies used in air protection	2,00	2,33	0,33

Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

In the case of Finland, the level of competence gaps differs significantly from the average aggregate deficit level (Figure 34). For all competences, Finnish entrepreneurs considered the skills of the employees to be more than relevant. Particularly large references can be seen in the preparation of air pollution balances (competence gap at the level of -0.03 - all countries, competence gap at the level of 1.33 - Finland), Action Plan for reducing air pollution emissions (competence gap at the level of -0.31 - all countries), The competence gap at level 1.33 - Finland), Selection of techniques and technologies, tools and materials for air purification depending on the characteristics of the pollutants removed and the process conditions (competence gap at level -0.18 - all countries, competence gap at level 1.33 - Finland).

Figure 34: Specific competence gaps in the field of air protection - comparison with Finland



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

4.1.3. Water management area

Turning to the area of water management, attention should be paid to the small number of companies (2 out of 6) that referred to this issue in the study (the others indicated that as a result of their activities there is no water consumption). One of the companies indicated the lack of relevance of competences in water management, while the other considered all competences to be relevant (Figure 35).

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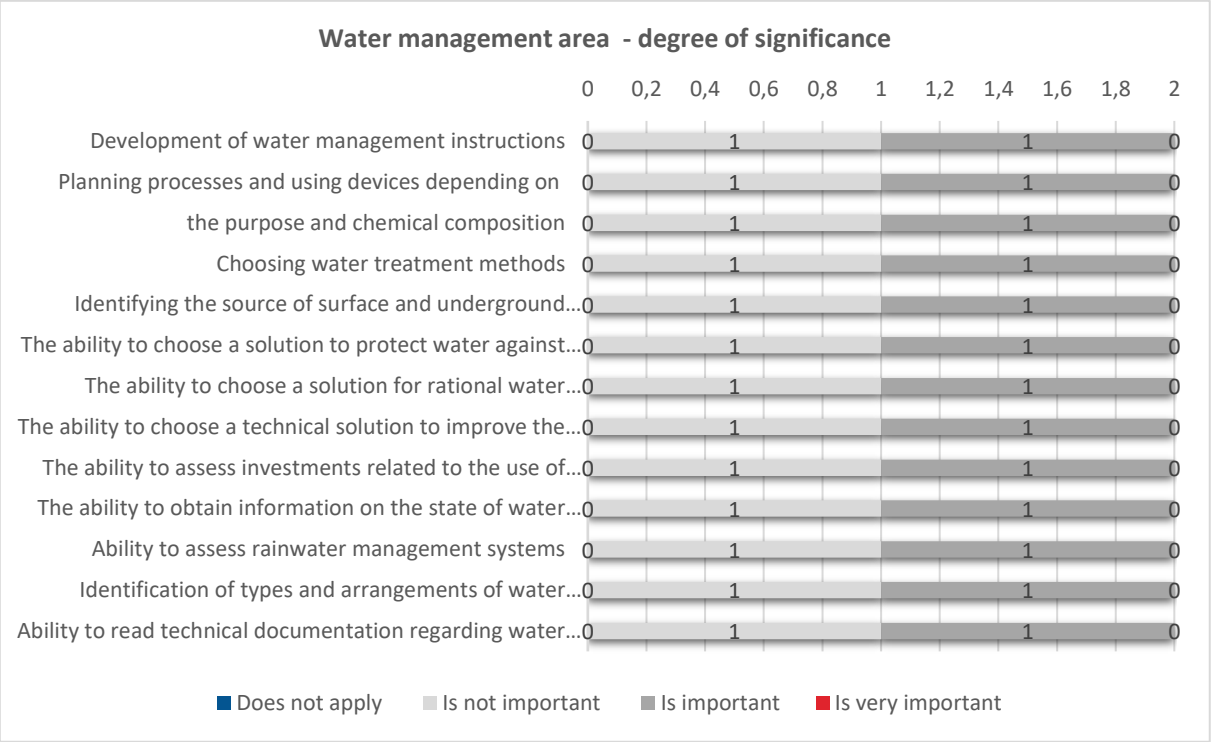
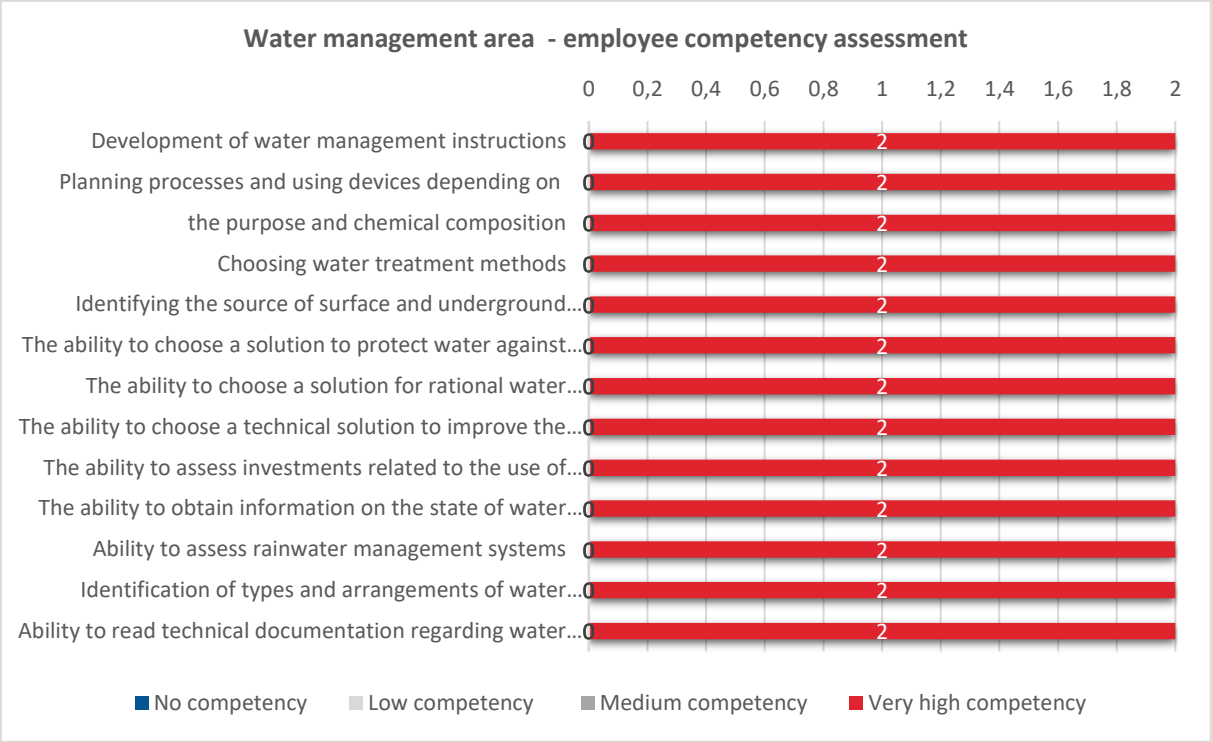
Figure 35: Level of relevance of competences in the field of water management - Finland



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

Figure 36 presents entrepreneurs' answers to their opinions on the state of competence of employees in the area of water management. Both companies were of the opinion that for all these skills their employees have very high competences.

Figure 36: Level of competence of employees in the field of water management - Finland



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

As in previous areas, there are no negative competence gaps in water management, which means that the actual skills of the employees of both companies are higher than the assessment of the relevance of the respective competences for the companies (Table 9).

Table 9: Specific competence gaps in water management - Finland

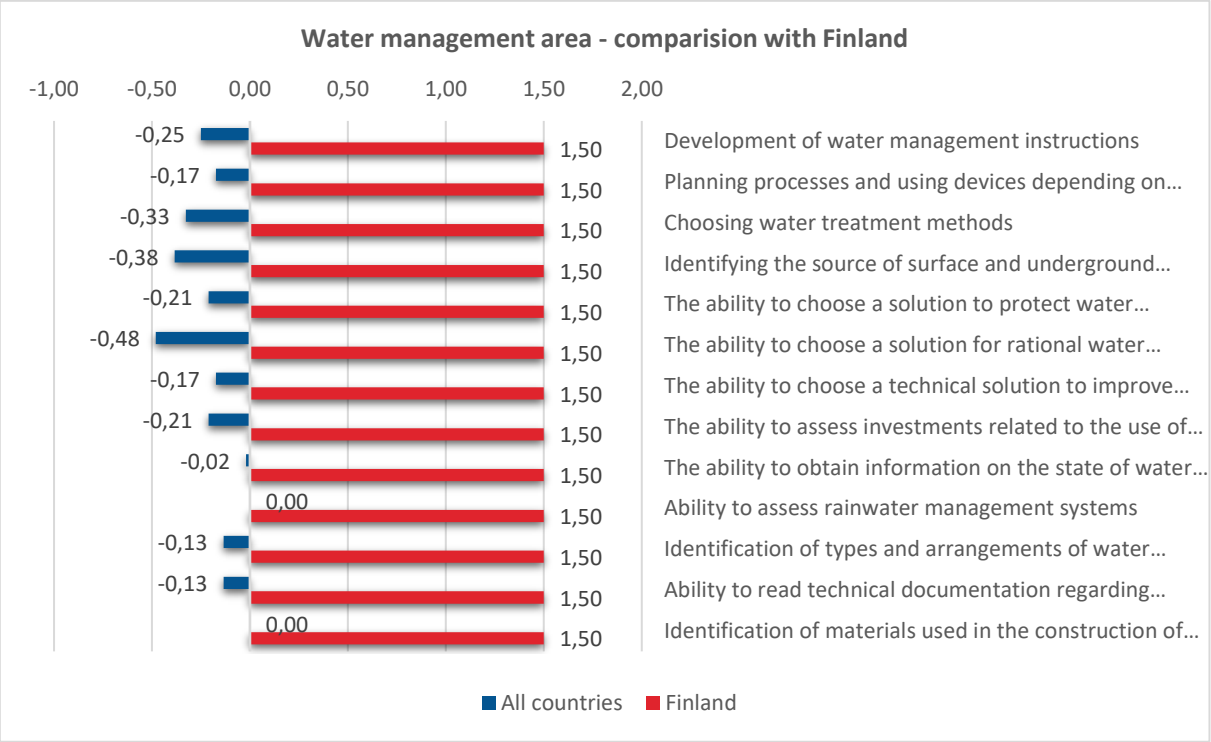
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Water management area	**1,50**	**3,00**	**1,50**
1	Development of water management instructions	1,50	3,00	1,50
2	Planning processes and using devices depending on the purpose and chemical composition	1,50	3,00	1,50
3	Choosing water treatment methods	1,50	3,00	1,50

4	Identifying the source of surface and underground water pollution	1,50	3,00	1,50
5	The ability to choose a solution to protect water against secondary pollution	1,50	3,00	1,50
6	The ability to choose a solution for rational water consumption	1,50	3,00	1,50
7	The ability to choose a technical solution to improve the quality of captured water	1,50	3,00	1,50
8	The ability to assess investments related to the use of groundwater resources	1,50	3,00	1,50
9	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes	1,50	3,00	1,50
10	Ability to assess rainwater management systems	1,50	3,00	1,50
11	Identification of types and arrangements of water supply networks on the company's premises	1,50	3,00	1,50
12	Ability to read technical documentation regarding water management	1,50	3,00	1,50
13	Identification of materials used in the construction of plumbing	1,50	3,00	1,50

Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In the case of Finland, the competence gaps for water management reached a positive level of 1.50 - all of them therefore deviating from the averaged result for all countries (Figure 37).

Figure 37: Specific competence gaps in water management - comparison with Finland

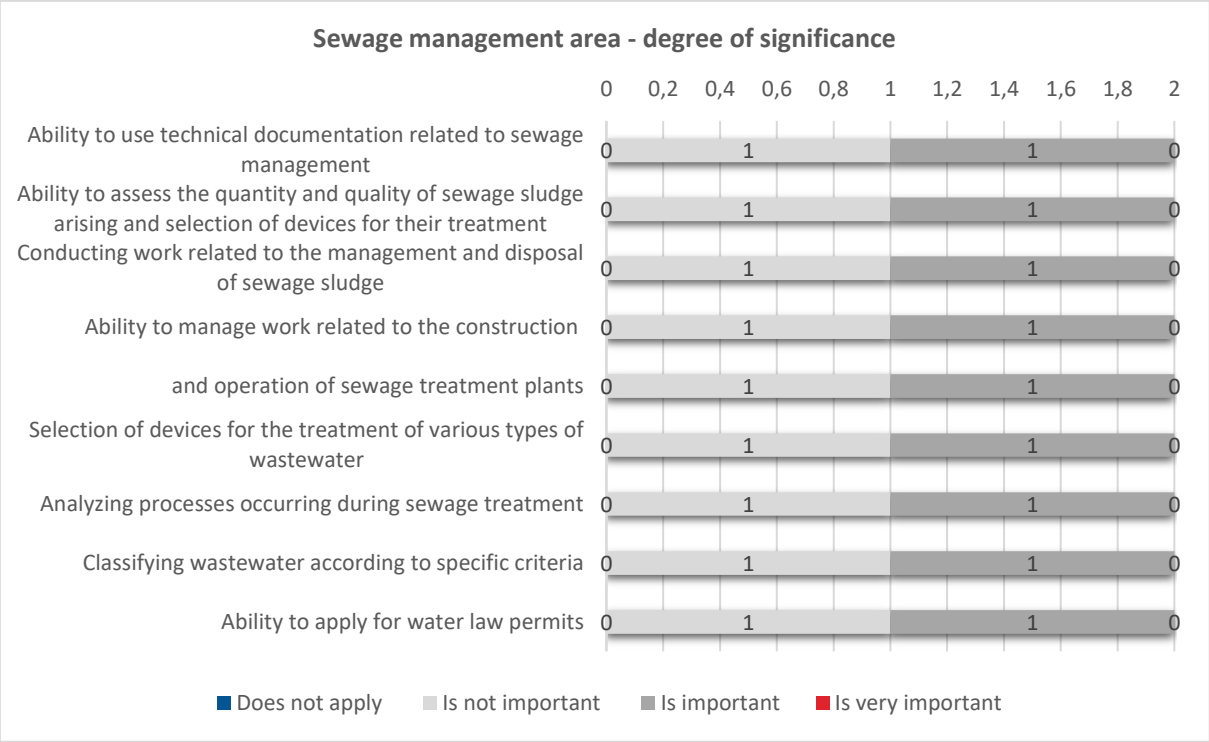


Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

4.1.4. Sewage management area

Analysing the area of wastewater management, one can see that the opinions of entrepreneurs are the same as those of the area of water management. Also in this case, only 2 out of 6 surveyed companies replied. The former pointed out the importance of all the skills listed, while the latter were of no significance (Figure 38).

Figure 38: Level of relevance of competences in the field of wastewater management – Finland



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In the case of all the mentioned competences related to wastewater management, both entrepreneurs considered that the skills of the employees in this area are at a high level (Figure 39).

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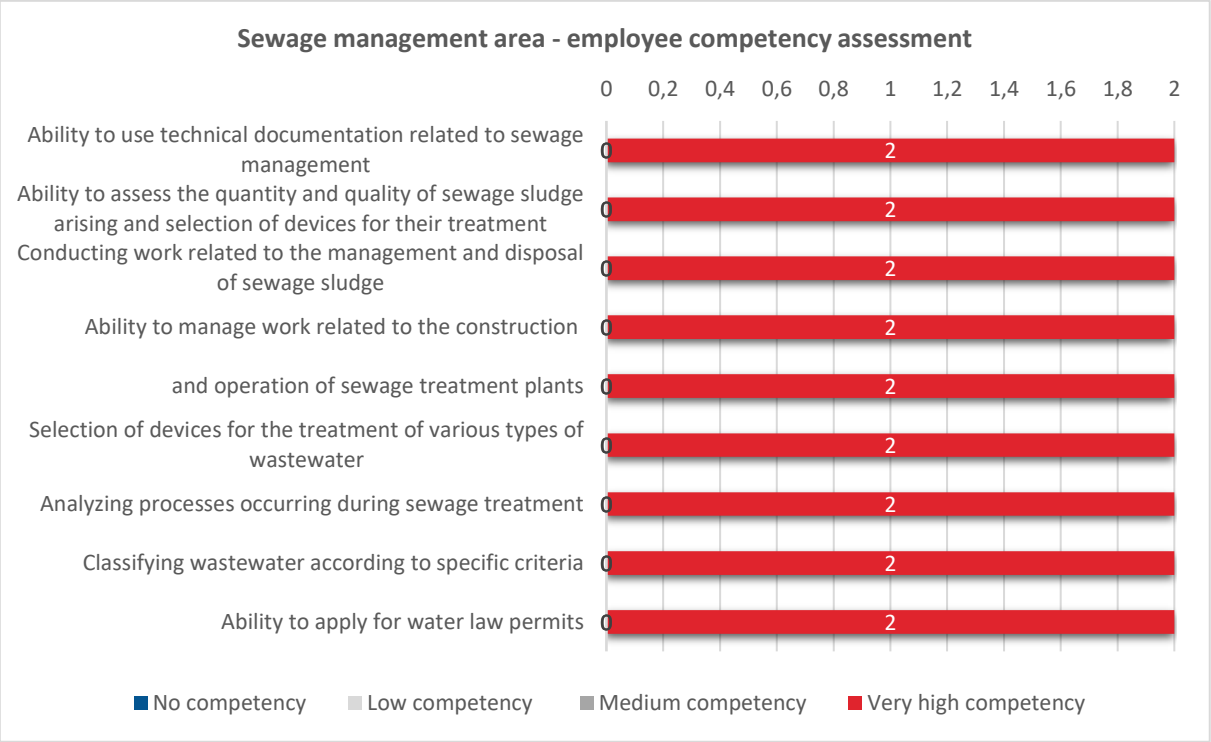
Figure 39: Employees' level of competence in the field of wastewater management - Finland



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In the area of wastewater management, there were no negative competence gaps. Therefore, it can be considered that in both surveyed companies the skills of the employees in this area are higher than the competence needs of the companies (Table 10).

Table 10: Specific competence gaps in sewage management - Finland

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Sewage management area	**1,50**	**3,00**	**1,50**
1	Ability to use technical documentation related to sewage management	1,50	3,00	1,50
2	Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment	1,50	3,00	1,50

3	Conducting work related to the management and disposal of sewage sludge	1,50	3,00	1,50
4	Ability to manage work related to the construction and operation of sewage treatment plants	1,50	3,00	1,50
5	Selection of devices for the treatment of various types of wastewater	1,50	3,00	1,50
6	Analyzing processes occurring during sewage treatment	1,50	3,00	1,50
7	Classifying wastewater according to specific criteria	1,50	3,00	1,50
8	Ability to apply for water law permits	1,50	3,00	1,50
9	Calculation of the degree of pollution reduction in wastewater	1,50	3,00	1,50

Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In Finland, most of the gaps related to wastewater management have a positive value of 1.50 - according to employers, their employees have higher competences than the entrepreneur would expect (Figure 40). As a result, the deficits differ significantly from the generalised values for all countries. The biggest discrepancies concern the ability to use technical documentation related to sewage management (competence gap at -0.17 - all countries, competence gap at 1.50 - Finland) and the ability to assess the quantity and quality of sewage sludge generated, to select equipment for sewage treatment (competence gap at -0.17 - all countries, competence gap at 1.50 - Finland).

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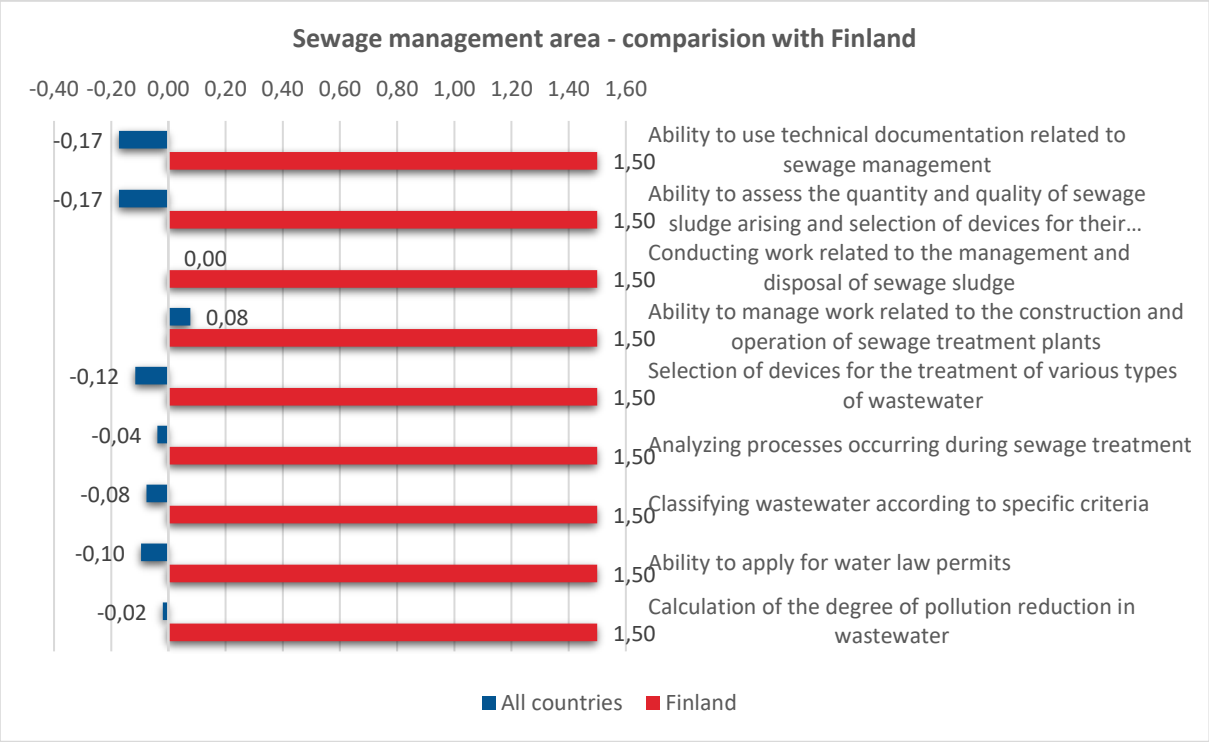
Figure 40: Specific competence gaps in sewage management - comparison with Finland



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

4.2. Experts' opinions on environmental management needs

The next stage of the study was qualitative interviews with experts in environmental management. In Finland, eleven experts were interviewed and asked questions about cost optimisation in the field of environmental management, training in environmental management, the use of renewable energy sources and competence needs in environmental management.

4.2.1. Optimisation of environmental management costs in SME enterprises

The experts were asked about the importance of **cost optimization in the field of environmental management in enterprises of the SME sector**. All interlocutors agreed that this is a very important issue: *Optimisation of energy solutions is an important factor in the costs of enterprises. Apart from cost savings, the use of renewable energy as well as waste management and possible use of by-products are important image factors for the company* [7EF]. *Cost optimisation plays a very important role in managing environmental problems in SMEs. The management of waste and sewerage systems is important from an economic point of view* [10EF], notes another expert. Moreover, *the importance of these costs is constantly growing and will continue to grow in the future* [1EF].

As one of the respondents mentioned, a lot depends on the type of company and the regulations in force: *the situation is completely different in companies dealing with these problems. Usually in these companies the staff*

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undergoes training tailored to the tasks and legal requirements. Some tasks cannot be performed without proper education and official certificate (e.g. https://fise.fi/en/). The Finnish vocational training system provides qualifications for many professions (see https://minedu.fi/en/vocational-education-and-training). Environmental management is a very important factor in Finnish SMEs, although companies do not recognise its value. In Finland, electricity, water, sewage, waste and heating/cooling are current topics. Material and energy efficiency and logistics and transport are also important. Of course, these depend entirely on the type of company. However, the actions should be very concrete when we talk about SMEs. Companies understand the euros saved, but they do not understand the image or the legal problems. Optimisation options for Finnish SMEs are quite limited due to strict regulations: laws, decrees and local regulations give companies quite strict guidelines and company obligations (example: https://www.suomi.fi/company) [8EF].

Another expert has also referred to the issue of strict legislation - *in the real estate management industry, costs related to environmental management, in particular those caused by water, sewage and waste management, are among the most unusual costs. This underlines the importance of optimisation. However, in Finland, the possibilities for optimising environmental costs caused by water, wastewater and waste management are very limited due to strict legal regulations that give privilege to municipalities if the waste does not come from commercial production or other economic activities. In fact, according to the law, waste produced in private homes is seen as municipal property and only the municipality has the right to say what to do about it. This means that - with few exceptions - the water and sewage infrastructure is managed by municipal institutions or companies owned by municipalities. Solid waste management is more diverse. The commune may grant houses and real estate companies the right to invite tenders for waste management on their own, the commune may propose an offer for field waste management on its own, and the winner takes care of waste management in the whole area or the municipal institution takes care of waste management in the whole urban area* [9EF].

The overall expert opinion on this issue can be summarised by the statement of one of the interlocutors that *all SMEs should optimise costs - not only in the field of environmental management, but in all areas. This is essential for their survival* [11EF].

The second question in the qualitative study concerned **aspects of the green economy (e.g. electricity, waste, water, sewage, heating), which should be the focus when planning educational programmes for SMEs.** Experts' opinions on this issue vary, although everyone stresses the importance of all elements: *I do not see the possibility of omitting any aspect when planning educational programmes for SMEs. Electricity, waste, water, sewage, heating are more or less involved in all SME sectors, but there are other issues that may be more sector specific, such as transport and logistics* [4EF].

At the same time, the interviewees exposed various areas that they believed to be of particular importance. For some of the interlocutors this aspect was energy and waste - *it is very important to help SMEs to improve their skills in energy efficiency and ways to reduce energy costs. Moreover, skills related to waste treatment, waste prevention and the benefits of a circular economy are important* [2EF]. In addition to waste, the issue of sewage has also emerged: *All aspects are important, but perhaps we should focus more on waste and wastewater, because it should be treated as a resource but not a waste in the future* [11EF] and recycling - *more resource efficient use and recycling if possible and appropriate* [3EF].

According to one expert, *education should be sector-oriented, as some sectors are more regulated than others. All companies can of course save money with renewable energy and water saving solutions, for example with new types of taps or circular systems. Waste management is important for all companies. In Finland, the legislation defines how waste must be handled and which fractions must be collected and how* [8EF].

4.2.2. Renewable energy sources

The next area of attention was **the importance of the use of renewable energy sources (RES) in the SME sector and the desirability of promoting training in this field**. The opinions of the interlocutors were rather similar - they unanimously stressed the importance of the use of RES and the need for training. *The use of renewable energy sources is the most important responsible and environmental factor for companies - said one of the experts. The other interlocutors argued similarly: Renewable energy is of course very important for SMEs in Finland (see https://tem.fi/en/renewable-energy, https://tem.fi/en/energy-efficiency and https://tem.fi/en/wsparcie-energetyczne)* [8EF]. *RES should be used much more often than in the past. Training is necessary to raise these new possibilities in the awareness of each* [1EF]. *The use of renewable energy sources should be promoted everywhere in our society, including in SMEs. There is certainly a need for training, especially related to costs (related to the previous question)* [10EF]. *Alternative energy sources will challenge larger energy production systems and introduce changes in the institutional framework. This may even have some impact on competition as opposed to water, where such alternatives are not so visible (except for on-site systems)* [3EF].

Some differences have emerged in the level of imagination about training: *The time spent by companies is limited, so training should be short information packages* [7EF]. In the opinion of another interlocutor these should be *open lectures and consultations* [6EF]. *The training should focus on realistic applications for solar power generation. Geothermal solutions are also applicable. Biomass solutions are applicable only in larger SMEs and require a permit - emphasises another interlocutor. Another adds that information and training on the impact of energy consumption on climate and various RES alternatives are needed, their cost effectiveness is also important. Farmers and SMEs in the country would benefit from information on biogas production, decentralised energy production and use of local energy sources* [2EF]. Another expert stressed that *it is very important to enable the introduction of real alternatives to the market. Today's renewable energy suppliers are not able to respond to the needs of a larger real estate company. In order to change the situation, education is needed for all participants of energy markets, both producers, consumers and municipal authorities licensing e.g. for windmill parks. The training should be focused on all kinds of energy sources, energy transfer and the design and production of energy-using equipment, not forgetting the energy efficiency of buildings* [9EF].

There were also opinions on training at the level of vocational schools and universities: *However, training in vocational training institutes (technicians, fitters) and higher education (system planning) is at a good level. This means that SMEs can use experts outside their own company and buy services offered by other companies. All SMEs do not need renewable energy experts in their own staff. One of the topics of education directed at company leaders may be the financial aids available for renewable energy solutions. Heat pumps are already widely used in Finnish SMEs, partly due to the low purchase price compared to solar energy solutions* [8EF].

4.2.3. Assessing competence needs for environmental management

In the following part of the interview, experts were asked to **assess the specific competence needs related to environmental management in the SME sector.** They were supposed to consider which competences of SME employees in the field of **waste management** are important for the functioning of SME companies and which of them should be taken into account when planning educational programmes. In addition to the idea of providing general information on these issues, more specific proposals were made: *Organising waste collection and disposal - it is important to develop holistic systems appropriate in terms of scale. Sometimes too much transport is needed to achieve the objectives instead of optimising the most feasible solutions. Hazardous waste management - In Finland, in my opinion, a centralised waste collection system and one hazardous waste management facility worked well. Of course you have to use large volumes and the best technology available. The use of bio-waste, for example, can be managed much more often, e.g. on a regional level or similar. We must have a sufficient number of collection points. It makes no sense if we have to transport plastic waste for tens of kilometres. On a general level, attitudes are important when collecting waste* [3EF]. According to another survey participant, *the focus should be on waste sorting and its impact on landfill, treatment methods, etc. The interpretation of sorting criteria and regulations should also be noted and should be practised regularly. It would be important to consider the management of harmful substances during storage and different waste treatment methods. It would be good to have knowledge of sewage sludge and various liquid wastes* [10EF]. The issue of waste sorting was also raised by other speakers: *Skills in waste sorting and organising waste collection are important as more and more companies realise the importance of recycling and reusing waste* [2EF]. *When a company starts sorting waste, it is good to have a short check-in for employees to explain why and how to sort waste. The signs in each waste bin should be clearly written on it. When sorting begins, it usually continues as a routine process. A list of recipients of landfill sites and landfill sites would certainly be a helpful tool for entrepreneurs* [7EF] - the expert noted. There is also a reference to the reuse of waste: *Knowledge of materials is important and how to deal with waste management and how waste can be used in other processes* [5EF].

It also stressed the need for a holistic approach when creating training on waste management: *Awareness of all aspects and details affecting waste and wastewater management, as well as energy efficiency, is essential, not only technical, but also attitudes and behaviour. It is also important that users, in our case living at home, are aware of the correct use of facilities, waste handling and environmental protection. Education and training should be comprehensive. Otherwise, there is always the risk that saving a drop means wasting the sea elsewhere. Waste management, especially wastewater management, also requires good knowledge of legal and local requirements, especially here in Finland. In some cases good relations with municipal and governmental authorities are also required* [9EF].

One of the participants in the survey referred to legal issues and related training on waste sorting, pointing out that *all Finnish companies must comply with the waste legislation, which entered into force in its renewed form on 1 January 2020. Companies must establish waste management plans, sort waste properly and ensure that the waste fraction is delivered to the collection company or municipal waste organisations. Hazardous waste must be treated in accordance with regulations (https://www.fortum.fi/en/business-clients). It may happen that an SME needs an environmental permit to start up (https://www.ymparisto.fi/en-US/Consumption_and_production). This permit covers all environmental topics related to the company's processes. The permit application is in most cases prepared by a consulting company. Similarly, if the company*

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is based or located in an area where water and sewage networks exist, the company must be connected to these networks: this is specified in the legislation. Companies cannot incinerate their waste: this is based on regulations. Therefore, the main emphasis in the educational programmes is on educating the company's staff in the proper sorting of the waste fraction. Also in Finland, it is important that companies producing surplus materials try to sell or distribute them on the platform https://materiaalitori.fi/. Companies should also get advice on saving materials and using less polluting or hazardous materials [8EF].

The experts also reflected on which **competences of employees in the field of air protection** are important for the functioning of companies from the SME sector and worth taking into account when planning educational programmes. The experts' proposals included *skills and technologies related to air purification and recycling in own production or by another company that could reuse them e.g. CO2 or heat* [2EF], *monitoring of air conditions and influencing them through the company's activities [6EF], activities and techniques to reduce emissions to the atmosphere* [7EF], *identifying the source of air pollution, determining the type and concentration of air pollution, choosing methods of air protection against pollution, organizing and conducting works related to the removal of air pollution and air purification tools and materials, choosing technologies* [11EF].

In the opinion of one of the respondents, *monitoring and detection is usually the first step to obtain reliable information as well as to identify sources. Therefore, finding methods of problem solving is another important step. However, strategies are needed to deal with the whole problem, therefore sufficient background information and broad knowledge play an important role* [4EF]. *It would be a good idea for education to explain what is required and what actions need to be taken to comply with the law* [5EF] - another expert noted.

The issue of legal aspects was also raised by another researcher: *In Finland, air pollution prevention measures are laid down in environmental permits. Equipment performance needs, systems and required reports are clearly indicated in these permits. Often SMEs set up risk management systems in which all company risks are indicated and elimination measures are explained. All companies must comply with laws and regulations. If they fail in these matters, they will be severely punished* [8EF].

Another issue was the specific **competences of employees in the field of water management** and their relevance to the functioning of SME companies and planning of educational programmes. According to the respondents, *this is a very broad and complicated subject. Training at many levels is necessary* [1EF]. According to the experts, examples of competences in water management that are worth working on during the training are: *skills in planning processes, so that water consumption is rational and water can be recycled in this process* [2EF], *closed wastewater treatment systems used in industry, learning different water management systems* [5EF], *reducing water consumption and influencing the purity of water through the company's activities* [6EF], *monitoring the state of the water and wastewater installation on the company premises* [7EF], *knowledge of the requirements and the ability to see the relationships between different solutions, different parameters* [9EF], *identification of types and distribution of water supply networks on the company premises. Ability to evaluate drainage water management systems, ability to read technical documentation on water supply management. General understanding of pollution sources, water treatment methods, groundwater basins and their classification and management of drainage water* [10EF], *ability to obtain information on the state of water resources, available types of surface and groundwater and types of water intakes, ability to evaluate rainwater*

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management systems, identification of types and distribution of water supply networks on the company premises and knowledge and ability to use water saving technologies and methods are important in this context - for all employees [11EF].

According to some experts, specialised training on water management in SME companies is not necessary: *Water problems depend on companies. Companies that only use urban water networks do not need special know-how. All plumbing work is supervised during the construction phase and the materials are specified in the plans. Only qualified companies and their employees are allowed to carry out water installations. As mentioned earlier, if a company is located in a city where water and sewage networks exist, the company buildings must be connected to the systems. If they need a special type of water, these systems must be built according to permits and regulations. In rural areas, companies can use ground water and septic tanks or special sewage treatment facilities for water treatment. These systems must be planned by specialists and approved by various organisations and municipal water supply companies. Frankly speaking, I do not see any special training needs related to water-related questions in SMEs. Only in a few companies do the personnel have to be qualified, in which case normal education systems train them well enough* [8EF].

According to another expert *in Finland, SMEs are mostly connected to public water supply companies. If they have special requirements for water quality, they may need additional treatment technologies. If not, many issues have to be taken into account in the supply contract with the water supply company and the company. In principle, it is often economically feasible to develop water-saving processes. In this context, the recycling of potential streams should be assessed. If a company from the SME sector has its own systems, such as boreholes, it has to manage it itself, taking into account the local requirements and needs of the specific industry* [3EF].

They were asked what **competences of employees in the field of wastewater management** are important for companies in the SME sector and planning educational programmes. As indicated by the experts' statements, the issues raised should include topics such as *chemical safety* [5EF], *skills in water treatment and reuse methods* [2EF], *pre-treatment of sewage before discharge into the sewerage system, methods of recovering solids to reduce charges for sewage and reduce the amount of solids transferred to the treatment plant* [7EF], *the ability to use technical documentation related to sewage management, classification of sewage according to certain criteria, general understanding of treatment methods and alternatives, basic equipment and sludge treatment* [10EF] or more specialised, e.g. *selection of facilities for treatment of different types of wastewater, ability to build and operate decentralised wastewater treatment plants, and treatment and reuse of grey water* [4EF].

According to the opinion of another survey participant, *all employees need knowledge on how to carry out sludge management and disposal works, classifying wastewater according to specific criteria and the effects of wastewater (untreated and treated) on the environment. In other cases, employees working specifically in sewage management in SMEs are the target group* [11EF].

Some experts pointed out that the issue of wastewater management and selection of training in this area depends on the company's sector and its dependence on the public wastewater treatment system. *The problem is whether the SME company is connected to the public sewage treatment system. In this case, the requirements (possible pre-treatment before transfer to the WWT plant) must be agreed upon. In Finland, SMEs are almost always connected to public sewage systems. It has been noted that wastewater may contain sudden*

"pulsations" that can cause problems in a WWT. On the other hand, large WWTs have the capacity to buffer such sudden spills. In small businesses, local systems may be possible in case of remote location etc. [3EF].

The last issue raised during the expert interviews was the **competence of employees in the field of recycling, circular economy and environmental management** taking into account their importance from the point of view of the functioning of companies from the SME sector and the creation of educational programmes. A large part of the answers focused on the issue of circular economy. For example, one of the respondents stated that *a circular economy is nowadays a subject of import. It should be included in the programme, visions and strategies of a company. Since the topic of sustainable development and the circular economy is very broad, general answers to this question cannot be given. Companies should remember that they cannot make any promises of sustainability without adequate scientific evidence. Sustainability and circular questions should be considered in all company processes, planning, development, production, sales, marketing, care services, finance, transport, etc. First of all, the terminology and basic education on sustainability and the circular economy should be explained at the outset to each member of staff. It would also be useful to educate companies on the use of sustainable development and the circular economy tools so that they can transfer their achievements in standardised forms. Each company should think carefully about the extent to which it is pursuing, i.e. what are the main steps towards a circular economy or the achievement of sustainability goals* [8EF]. Another expert noted that *all topics related to the circular economy are important. The reason is that people are not aware of the circular economy (usually in combination with waste management) and we need to provide them with knowledge to create new innovations* [11EF].

Other competences worth training *are knowledge of waste management and energy options in order to be able to make offers and find solutions for different options. If an SME builds a property for itself, this should be taken into account already at the time of purchasing the land and when building the property* [5EF]. *Competence in circular management, recycling methods and techniques, environmental management and social responsibility business development. Understanding the regulatory framework is important because there are many different permitting and notification procedures for environmental issues* [10EF].

In the area of water and wastewater management, it is worth noting that the *integration of water and wastewater is not yet so widespread in Europe. Basically, this has several advantages, because we are talking about the same water. If the wastewater is properly treated before it is disposed of, this means that there is no longer the possibility of recycling in the institutional sense. The water literature talks a lot about the IWRM, but almost exclusively forgets this point. Interestingly, in Finnish we used one term for water and wastewater services. The term "vesihuolto" has been used since 1953, indicating at an early stage the integrated nature and recycling of water services. Too often in discussion, water recycling is associated with dual systems. In countries like Finland, any major dual systems would not be economically feasible. However, in individual cases this can be considered in SMEs* [3EF].

According to the experts, from the point of view of companies, it is also important to link ecology and marketing activities: *how to apply environmental awareness from the very beginning of marketing activities in the company. Competence in the ability to make better environmental choices and run companies, how this knowledge and actions can be a competitive advantage* [5EF].

4.3. Examples of good practice in environmental management

The last stage of the conducted analyses was desk research, i.e. study of existing data, which consisted in the analysis of texts and materials available on the Internet describing examples of good practices in green education implemented in the country. Descriptions of examples of good practices implemented in Finland are presented below.

LIFE CIRCWASTE - cooperation for improved waste management in Finland [29]

The LIFE CIRCWASTE project started in 2016 and is a long term impulse for improving waste management in Finland. It focused on the south wester, central, and eastern regions of the country, implementing almost 20 measures via 10 financing organisations. These are partners who took it onto themselves to implement a nation wide waste plan. From Rovaniemi, the gateway to Lapland, to the south-western reaches of Turku, Finnish Cities and towns implement the national waste management plan. The 7 year integrated Life Project, CIRCWASTE, supports the implementation of the plan. The actions in the project are coordinated by a network led by the SYKE Finnish Environmental Institute and MOTIVA Centre for Circular Economy Services. While the organisations are different in terms of scope, all measures have common goals in terms of the national waste management plan, including:

- reducing the amount of solid communal waste and reaching the recycling objectives,
- expanding the scope of recyclable communal waste,
- improving the recovery of hazardous waste,
- exchanging information on new measures in terms of circular economy, priority sectors, material flows and value chains.

The ultimate goal is the implementation of systemic changes in waste management. The realisation of the national Circwaste facilitates the launch of new projects and processes wthich support waste management and circular economy. One example is JÄTEKIVA (website in Finnish), a subproject which analyzes the ways of collecting larger amounts of waste most effectively, taking into account population density, geographic location, regulations, and other factors. The results are shared with public authorities and private waste collectors, decision makers, and the general population. Another subproject by Circwaste is located at the Peittoo in Pori on the west coast. 760 hectares are available for a complex of circular economy project or testing new ideas. Businesses may conduct practical experiments, run pilot programmes to indicate that their ideas are tried and tested in practice, and reproducible in other locations. This not only reduces waste but also creates new business opportunities. The new park is part of Pori's broader plans for establishing a resource efficient neighbourhood, starting from best practices in construction and housing, through green orders in new construction projects. The town of Ii on northern Ostrobothnia is an example of circular economy. It received the 2017 RegioStars EU award for significant emission reduction ambitions. Today Circwaste is supporting the reduction of food waste in schools, recycle construction materials in shared areas and playgrounds, and study

[29] Life Circwaste. Internet access: https://ec.europa.eu, [access: 11.03.2020]

improved options for community transportation. Circwaste hopes that circular economy pioneers will inspire other cities and regions to find ways of achieving the project's objectives on circular economy, and therefore contribute to the realisation of the national waste plan. More inspiration is available in the "best examples" section (in Finnish) of the SYKE website. The service encourages businesses, universities, and other organisations to share good examples of recycling, product design, sharing and reusing through films, blog posts and case studies.

Green Building Council Finland[30]

GBC Finland promotes knowledge about sustainable development and encourages to implement its aspects as natural parts of the real estate industry and construction. Taking energy and environmental efficiency into consideration provides significant benefits to property owners, investors, users, designers, and developers in Finland's construction environment. GBC Finland promotes new and innovative solutions and offers independent information and research which may be used by associated members in the decision making process. The association provides its members with training on sustainable development, information and developmental services. GBC Finland also presents a national perspective of adjusting international environmental standards such as LEED and BREEAM to Finnish real estate. A "Green" building is designed, built and used in a way which reduces or eliminates its negative impacts and can have positive effects on our climate and natural environment. Green buildings protect valuable resources and improve the quality of life. There are numerous functions which make a building "green". These include:

- effective use of energy, water, and other resources,
- use of renewable energy sources, such as solar power,
- measures limiting pollution and waste, enabling recycling and reuse,
- good air quality indoors,
- use of nontoxic, ethical and sustainable materials,
- includes environmental aspects in design, construction, and use,
- takes into consideration the aspects of quality of life during design, construction and use,
- designs adaptable to a changing environment.

Each building may become green, no matter if it is a house, office, school, hospital, culture centre, or any other type of structure, provided that it has the above functions. IT is worth noting that not all green buildings are - or have to - be identical. Different countries and regions have different features, such as specific climate conditions, unique cultures and customs, various types and ages of buildings, as well as broadly outlined environmental, economic and social priorities - all thous should shape the approach to ecological construction. That is why WorldGBC supports the members of Green Building Councils and its member companies in individual countries and regions to erect green buildings which suit their markets best. To participate in the transformation of your country into a green building, contact your local Green Building Council or sign up.

[30] Green Building Councils. Internet access: https://www.worldgbc.org, [access: 11.03.2020]

BFKK competencies to work

WWW&CE

Water, Waste & Circular Economy

Lithuania

Lietuva

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HANSE-PARLAMENT
Network for Small and Medium Enterprises

WWW&CE

Lithuania

Research in Lithuania was conducted by the Chamber of Commerce, Industry and Crafts, Vilnius University of Technology; Vilnius Building Training Centre. The survey was conducted by the Chamber of Commerce, Industry and Crafts, Vilnius University of Technology and Vilnius Training Centre for Construction. 38 companies operating in Lithuania participated in the survey. The largest number of them, 19 of which were medium-sized enterprises, 17 belonged to the category of small enterprises, and the remaining 1 were micro enterprises. Half of the analysed companies operate in industry (19 companies), the remaining ones belong to the business services (including business services), real estate, trade and repair, service, social and individual activities, education and construction.). This chapter presents Lithuanian good practices in the development of green competences: Green training for professionals in the construction sector; Modular vocational training in Europe.

Lithuania

Lietuva

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HANSE-PARLAMENT
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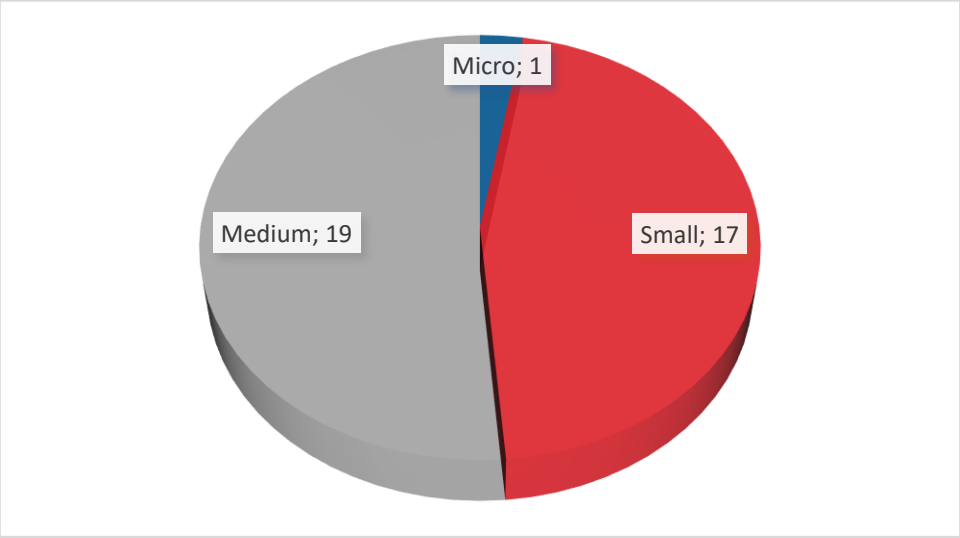
5. Lithuania

5.1. Results of quantitative studies on environmental management needs

The survey involved 38 companies operating in Lithuania. The largest number of them, 19 of which were medium-sized enterprises, 17 belonged to the category of small enterprises, the remaining 1 was a micro enterprise (Figure 41).

Figure 41: Company size - Lithuania



Source: Own study based on the findings of the survey, n=38; n - number of companies surveyed

Half of the analysed companies operate in industry (19 companies), the rest belong to the industry related to business services (including business services), real estate, trade and repair, service, social and individual activities, education and construction (Figure 42).

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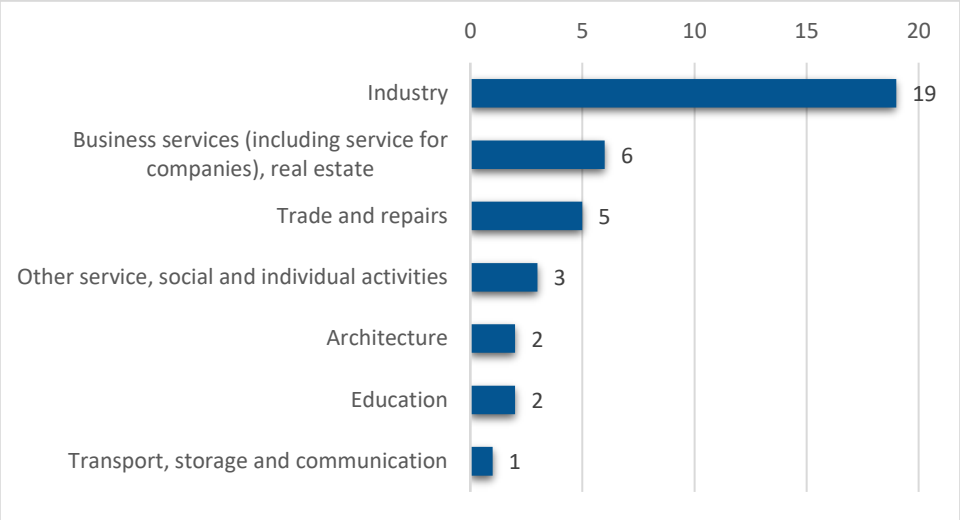
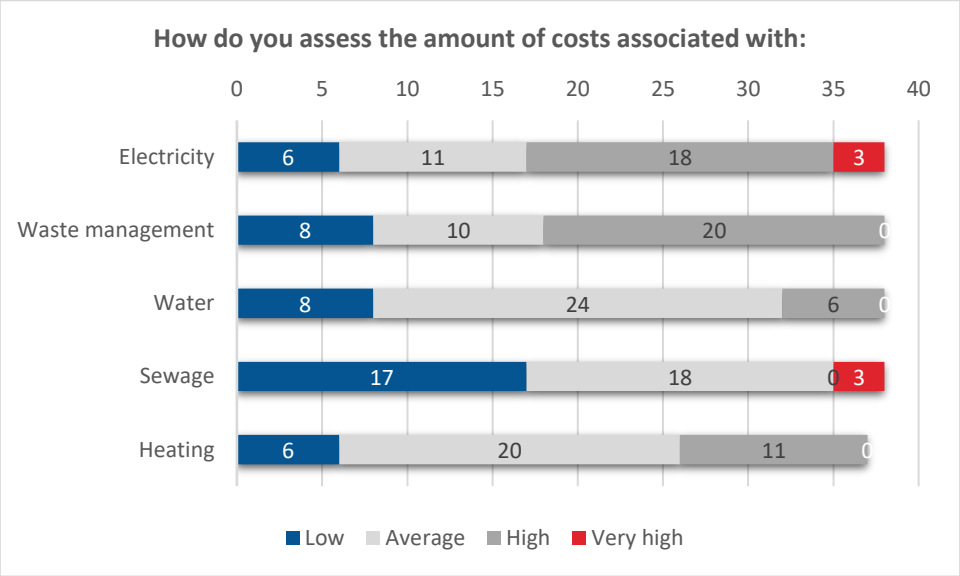
Figure 42: Main activity of the company – Lithuania



Source: Own study based on the findings of the survey, n=38; n - number of companies surveyed

Entrepreneurs were asked to assess the amount of costs related to electricity, waste, water, sewage and heating in relation to the total cost of the company (Figure 43). The answers indicated low or medium costs incurred in the production of sewage (17 companies - low, 18 companies - medium), water consumption (8 - low, 24 - medium) and heating (6 - low, 20 - medium). For electricity and waste generation, more than half of the answers indicated high or very high costs.

Figure 43: Costs incurred - Lithuania



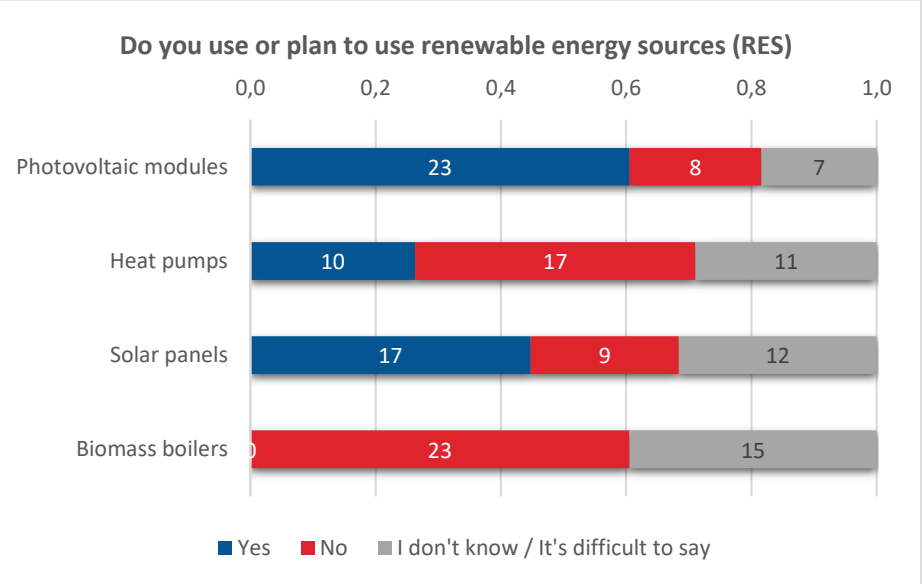
Source: Own study based on the findings of the survey, n=38; n - number of companies surveyed

Lithuania

Lietuva

In response to the question about the use of renewable energy sources (RES) and their planned introduction in the future, the majority of entrepreneurs stated that biomass boilers are not and will not be used (23 answers). The 17 surveyed entrepreneurs are also not interested in heat pumps. On the other hand, there is great interest in photovoltaic modules (23 companies) and solar collectors (17 companies) - Figure 44.

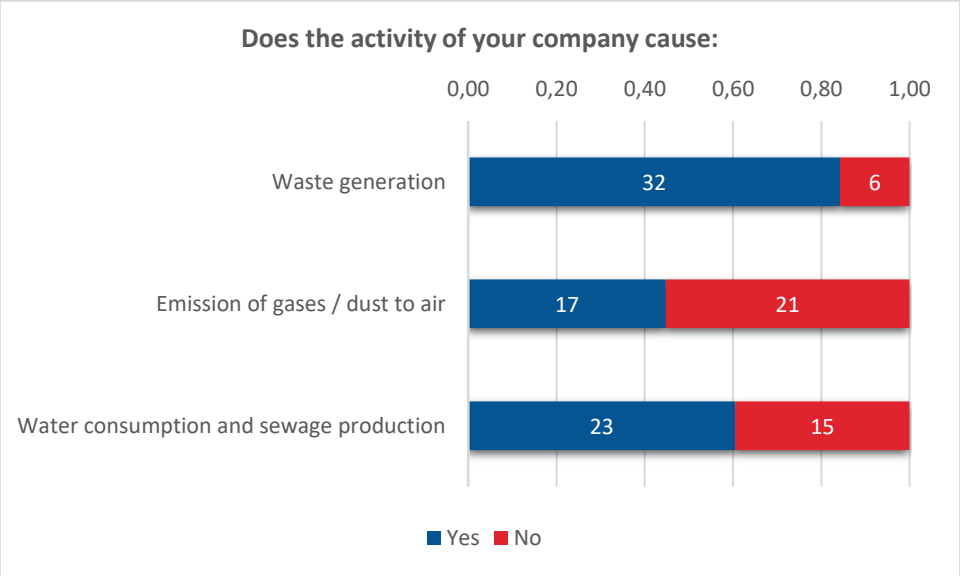
Figure 44: Use of renewable energy sources in companies - Lithuania



Source: Own study based on the findings of the survey, n=38; n - number of companies surveyed

A filtering question was used in the research questionnaire in order to identify possible types of pollution produced by the surveyed companies, which subsequently allowed to identify areas requiring detailed analysis in terms of competence needs in environmental management. On this basis, companies that produce waste (32 surveyed companies), emit gases and dust into the air (17 companies), and use water and produce sewage (23 companies) were identified (Figure 45).

Figure 45: Types of pollution generated by companies in their business activity - Lithuania



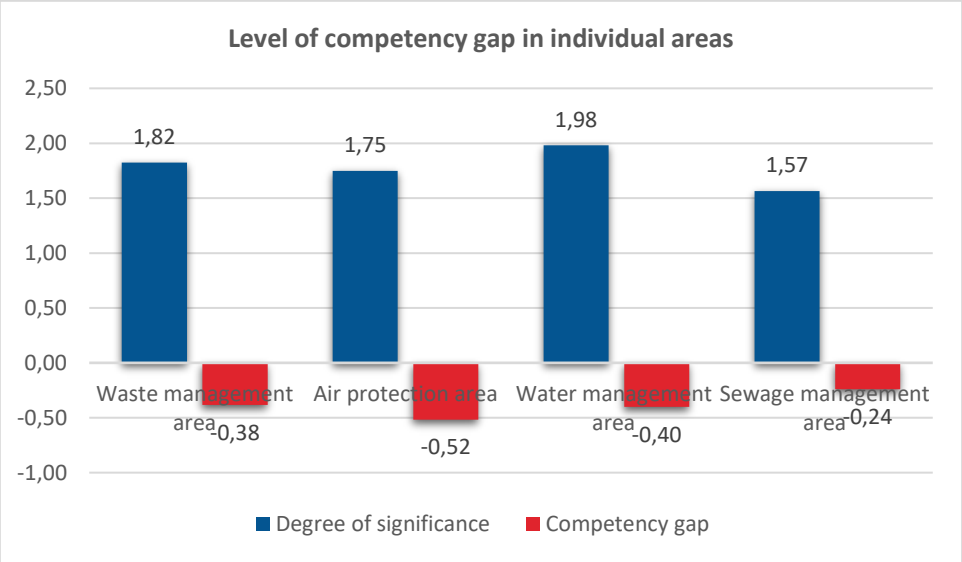
Source: Own study based on the findings of the survey, n=38; n - number of companies surveyed

Within the identified areas, the surveyed entrepreneurs were asked to assess the degree of significance of particular competences related to environmental economy from the point of view of the specificity of their company's operations, on a scale from 0 to 3 (where 0 means that a given competence does not concern their company, 1 - is not important, 2 - is important, 3 - is very important) and on a similar scale, to assess the current state of competences possessed by employees (where 0 means lack of competences, 1 - low competences, 2 - medium competences, 3 - very high competences).

The questions concerning competence needs in particular areas 1) waste, 2) emission of gases and dusts into the air, 3) water consumption and sewage production were answered only by those companies which declared that they use a given environmental aspect.

Entrepreneurs considered that the area with the greatest importance of competences is water management, whose importance reached 1.98 (Figure 46). The second most important area was waste management (at 1.82). Slightly less importance was attributed to air protection (significance at 1.75) and sewage management (significance at 1.57). The greatest competence deficits of the employees were recorded in the area of air protection, where the gap was at the level of -0.52.

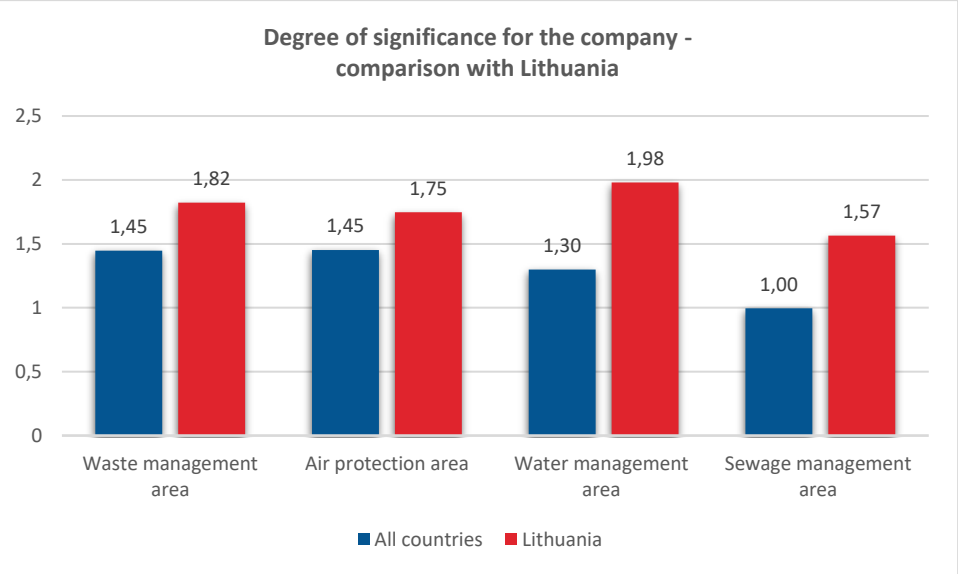
Figure 46: Level of competence gap in individual areas - Lithuania



Source: Own study based on the findings of the survey, n=38; n - number of companies surveyed

A comparison of the level of relevance of competences in Lithuania with the cumulative results for all countries does not indicate major differences. The largest differences are in the area of wastewater management, where the overall materiality level reached 1.00, while in Lithuania 1.57 (Figure 47).

Figure 47: Level of relevance of competences - comparison with Lithuania

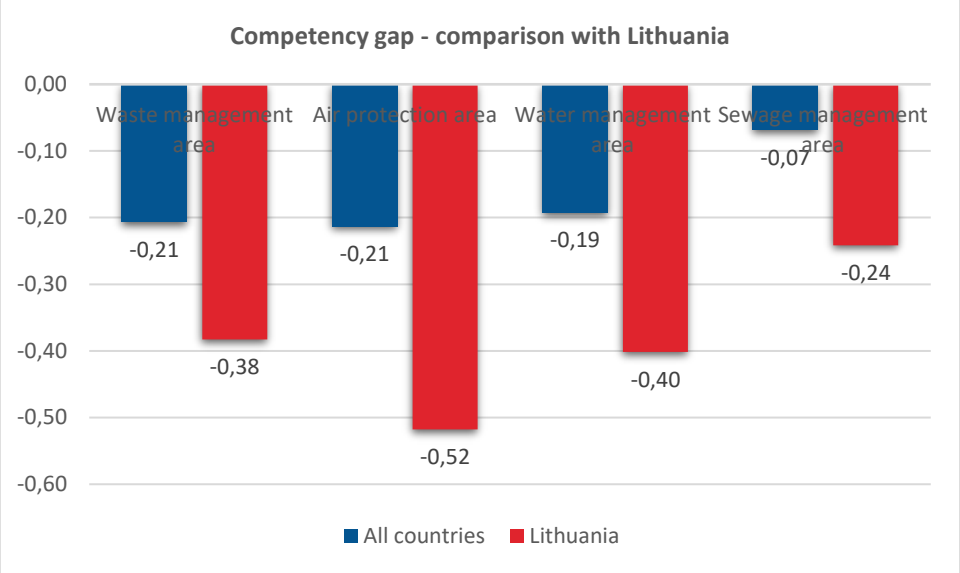


Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

The largest discrepancies in the average level of competence gaps can be observed in the area of air protection - the aggregate results indicate a gap at the level of -0.21, and according to Lithuanian entrepreneurs they reach

the level of -0.52 (Figure 48). A high gap concerning Lithuania appears also in the area of water management - at the level of -0.40. Compared to it, a lower level is indicated by the results for all countries - gap at the level of -0.21.

Figure 48: Level of competence gap in individual areas - comparison with Lithuania



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

5.1.1. Waste management area

In the second most important area of waste management, two competences can be distinguished, which were assessed as very important or significant by almost all surveyed Austrian entrepreneurs: Classification of waste according to specific criteria (23 companies - very important, 8 companies - important) and Sorting of waste (24 companies - very important, 7 companies - important). The following were also highly significant: Organizing waste collection and disposal (19 - very important, 10 - important), Determining the conditions and methods of waste disposal (15 - very important, 13 - important), Selecting the method of waste management (16 - very important, 12 - important), Observing the principles of waste storage and storage (17 - very important, 10 - important), Selecting the methods of waste disposal (11 - very important, 16 - important) - Figure 49.

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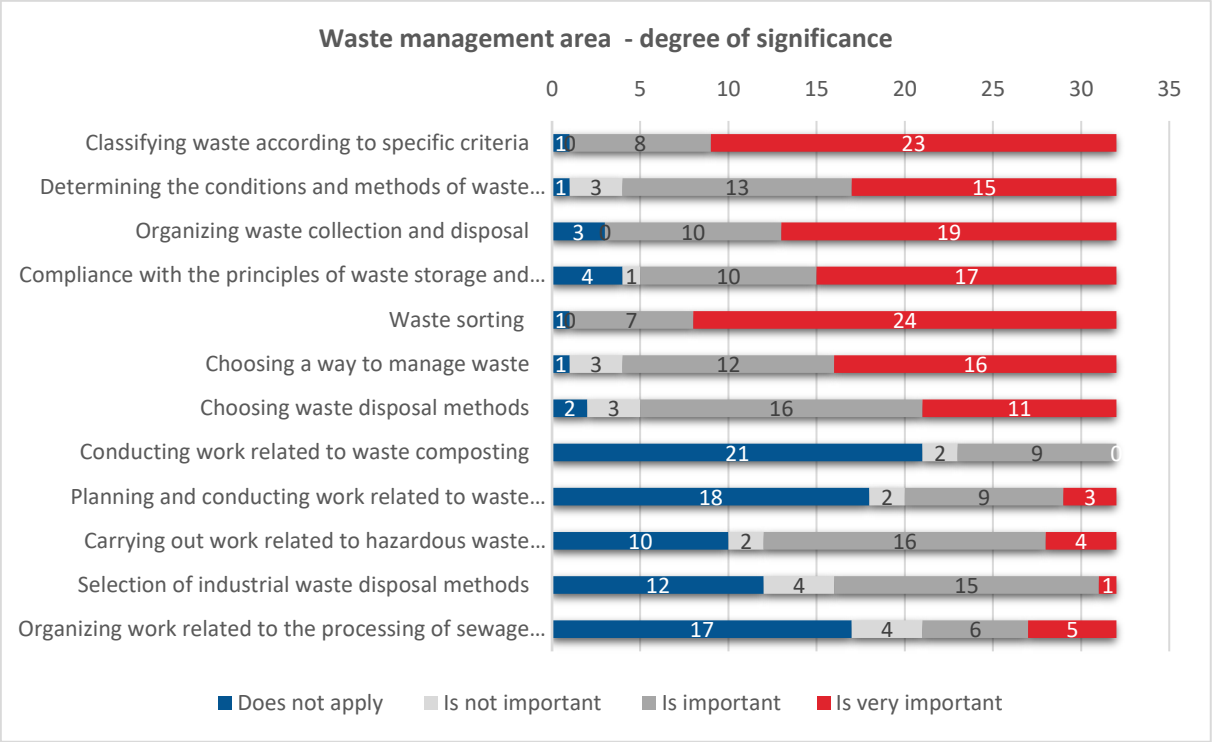
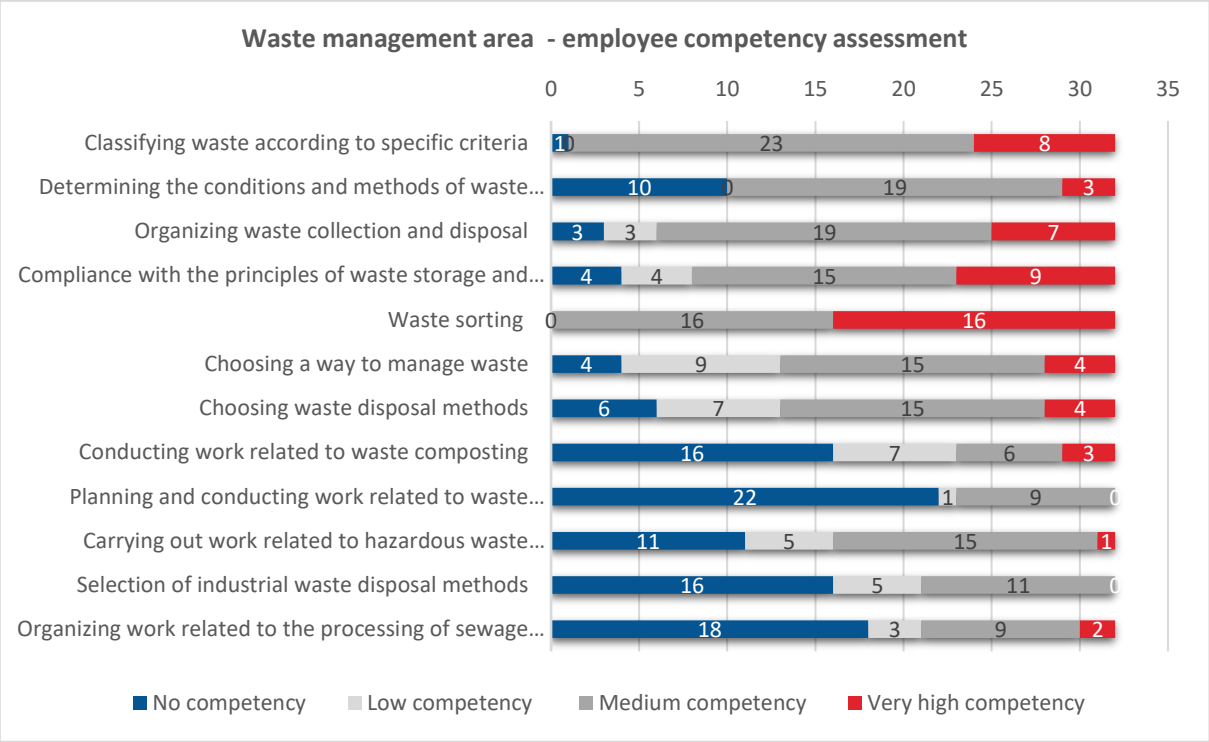
Figure 49: Level of relevance of waste management competences - Lithuania



Source: Own study based on the findings of the survey, n=32; n - number of companies surveyed

In the area of waste management, the level of competence of employees varies greatly depending on the individual skills (Figure 50). Medium or high competences concern Waste sorting (16 - very high competences, 16 - medium competences), Waste classification according to specific criteria (8 - very high competences, 23 - medium competences), Organization of waste collection and disposal (7 - very high competences, 19 - medium competences), Compliance with the rules of waste storage and disposal (9 - very high competences, 15 - medium competences), Determination of conditions and methods of waste disposal (3 - very high competences, 19 - medium competences). Low competence or even lack of competence of the employees is reported by the employers in relation to: Planning and carrying out works related to waste incineration and operation of incineration plants (22 - lack of competence, 1 - low competence), Carrying out works related to waste composting (16 - lack of competence, 7 - low competence), Organising works related to sewage sludge treatment and equipment operation (18 - lack of competence, 3 - low competence), Selecting methods of industrial waste disposal (16 - lack of competence, 5 - low competence).

Figure 50: Level of competence of employees in the field of waste management - Lithuania



Source: Own study based on the findings of the survey, n=32; n - number of companies surveyed

Table 11 presents detailed data on the level of competence gaps in relation to waste management skills. As indicated by the data contained in the table, the largest competence gaps, understood as the difference between the level of materiality of competences and the actual skills possessed by the employees, are related to the Selection of waste management methods (competence gap at level -0.78), Determination of conditions and methods of waste disposal (at level -0.63), Selection of waste disposal methods (at level - 0.59). Slightly smaller competence gaps, at the level of -0.53, were identified within the framework of Classification of waste according to specific criteria and Organization of waste collection and disposal.

Table 11: Specific competence gaps in waste management - Lithuania

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Waste management area	**1,82**	**1,44**	**-0,38**
1	Classifying waste according to specific criteria	2,66	2,13	-0,53

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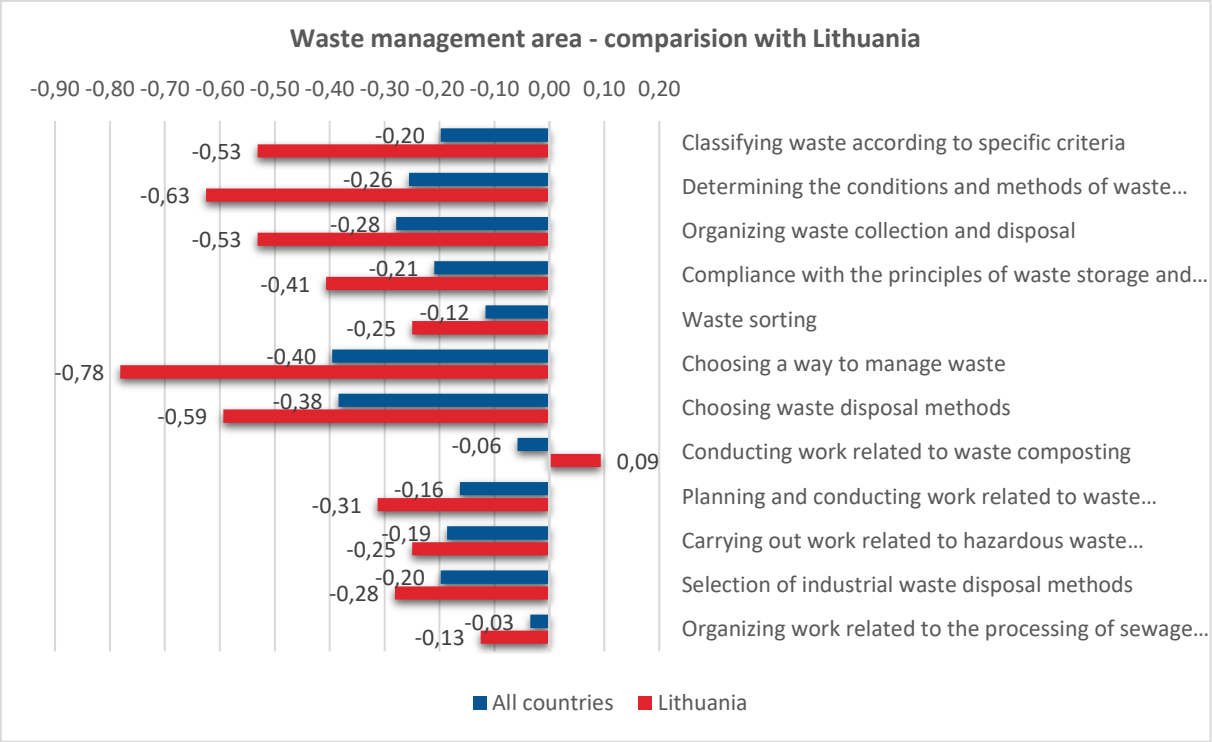
2	Determining the conditions and methods of waste disposal	2,31	1,69	**-0,63**
3	Organizing waste collection and disposal	2,41	1,88	-0,53
4	Compliance with the principles of waste storage and storage	2,25	1,84	-0,41
5	Waste sorting	2,69	2,44	-0,25
6	Choosing a way to manage waste	2,34	1,56	**-0,78**
7	Choosing waste disposal methods	2,13	1,53	**-0,59**
8	Conducting work related to waste composting	0,63	0,72	0,09
9	Planning and conducting work related to waste incineration and operation of incineration plants	0,91	0,59	-0,31
10	Carrying out work related to hazardous waste management	1,44	1,19	-0,25
11	Selection of industrial waste disposal methods	1,16	0,88	-0,28
12	Organizing work related to the processing of sewage sludge and the operation of equipment	0,97	0,84	-0,13

Source: Own study based on the findings of the survey, n=32; n - number of companies surveyed

The biggest discrepancies in the level of competence gaps between Lithuania and the average result for all countries concern the classification of waste according to specific criteria (gap at -0.20 - all countries, gap at -0.53 - Lithuania), Determination of conditions and methods of waste disposal (gap at -0.26 - all countries, gap at -0.63 - Lithuania) and Selection of waste management (gap at -0.78 - all countries, gap at -0.40 - Lithuania). Among the competence gaps concerning Lithuania, there is also one positive value. It concerned the carrying out of composting works (gap at -0.06 - all countries, gap at 0.09 - Lithuania) - Figure 51.

Figure 51: Specific competence gaps in waste management - comparison with Lithuania



Source: Own study based on the findings of the survey, n=32; n - number of companies surveyed

5.1.2. The air protection area

In the area of air protection, most of the competences were assessed by more than half of the companies as important or very important (Figure 52). Among them, the employers attributed the greatest importance to the Selection of methods of air protection against pollution (7 - very important, 9 - important), Organizing and conducting works related to the removal of pollutants from the air (5 - very important, 9 - important), Identification of techniques and technologies used in air protection (4 - very important, 10 - important).

The following were also highly evaluated: Identification of the source of air pollution (6 - very important, 7 - important), Determination of the type and concentration of air pollution (3 - very important, 10 - important), Planning of activities related to the reduction of air pollution emissions (6 - very important, 7 - important) and Selection of techniques and technologies, tools and materials for air purification, depending on the properties of the removed pollutants and process conditions (13 - important).

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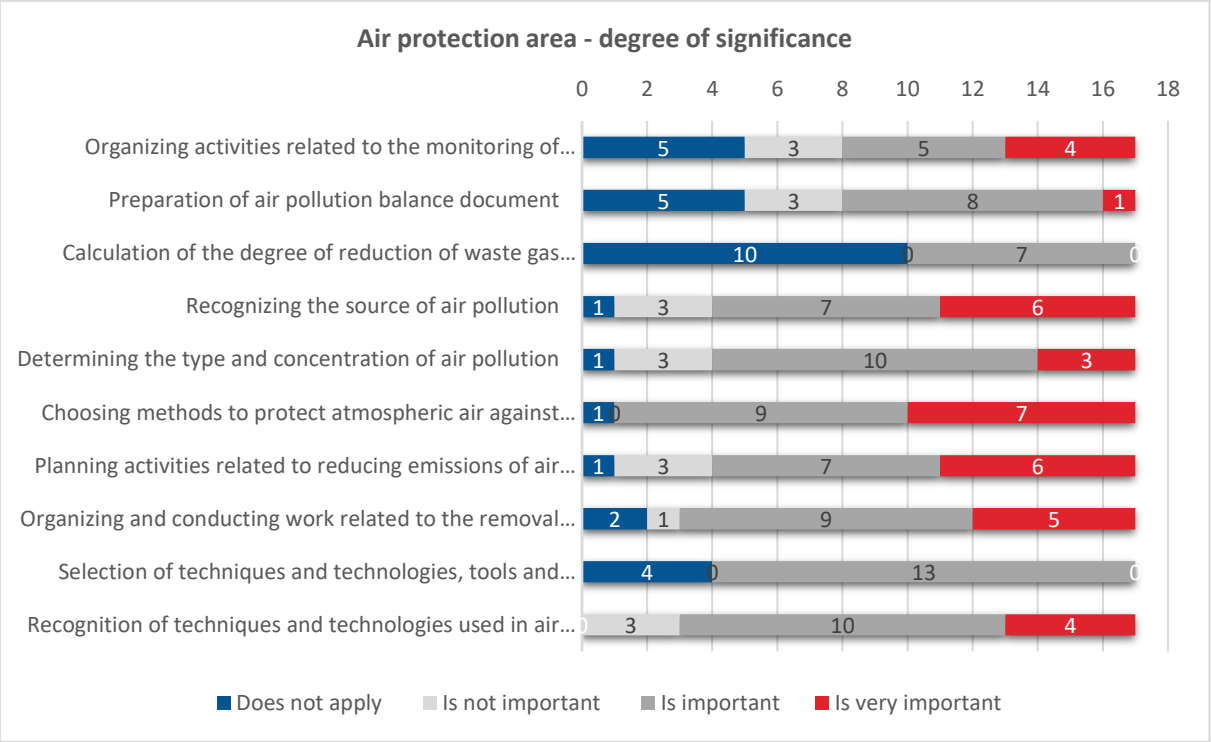
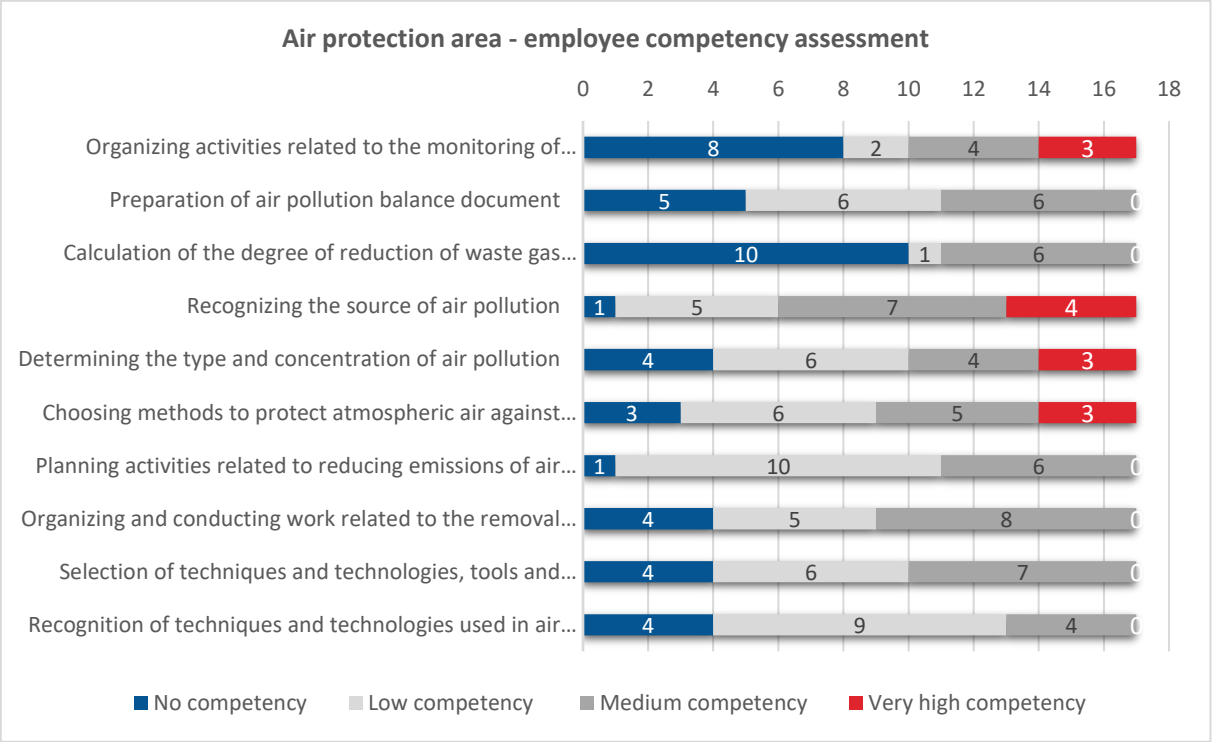
Figure 52: Level of relevance of competences in the field of air protection - Lithuania



Source: Own study based on the findings of the survey, n=17; n - number of companies surveyed

Entrepreneurs when asked about the level of competence of their employees in the field of air protection gave the weakest assessment of the skills related to calculating the level of reduction of waste gas pollution (10 - lack of competence, 1 - low competence), Organizing activities related to monitoring of air pollution (8 - lack of competence, 2 - low competence), Preparation of air pollution balances (5 - lack of competence, 6 - low competence), Identification of techniques and technologies used in air protection (4 - lack of competence, 9 - low competence), Planning of action related to the reduction of air emissions (1 - lack of competence, 10 - low competence) - Figure 53.

Figure 53: Employees' level of competence in the field of air protection - Lithuania



Source: Own study based on the findings of the survey, n=17; n - number of companies surveyed

Table 12 presents data on specific competence gaps in air protection skills. As the results show, the largest competence gaps were related to the Recognition of techniques and technologies used in air protection (gap at level -1.06), Selection of methods of air protection against pollutants (gap at level -0.82), Planning of activities related to the reduction of emissions of pollutants into the atmosphere (gap at level -0.76) and Organization and performance of works related to the removal of pollutants from the air (gap at level -0.76).

Table 12: Specific competence gaps in the field of air protection - Lithuania

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Air protection area	**1,75**	**1,23**	**-0,52**
1	Organizing activities related to the monitoring of atmospheric air pollution	1,47	1,12	-0,35
2	Preparation of air pollution balance document	1,29	1,06	-0,24

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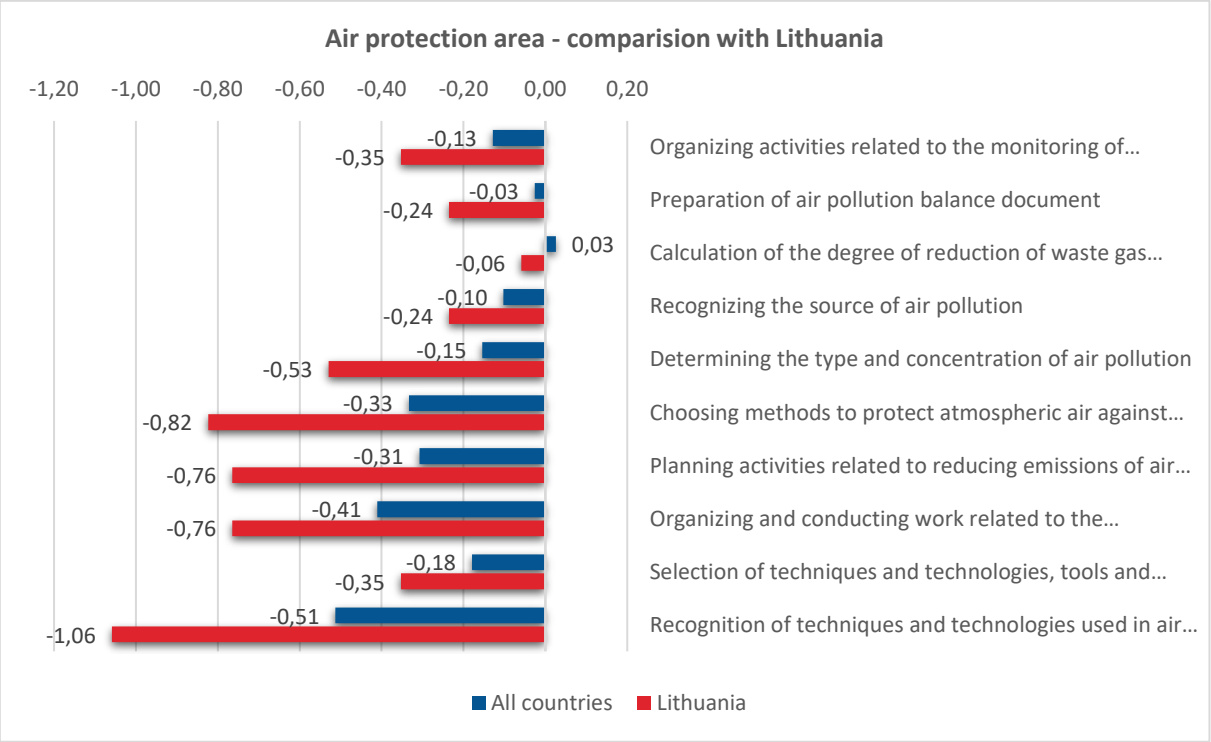
3	Calculation of the degree of reduction of waste gas impurities	0,82	0,76	-0,06
4	Recognizing the source of air pollution	2,06	1,82	-0,24
5	Determining the type and concentration of air pollution	1,88	1,35	-0,53
6	Choosing methods to protect atmospheric air against pollution	2,29	1,47	**-0,82**
7	Planning activities related to reducing emissions of air pollutants	2,06	1,29	**-0,76**
8	Organizing and conducting work related to the removal of atmospheric pollution	2,00	1,24	**-0,76**
9	Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions	1,53	1,18	-0,35
10	Recognition of techniques and technologies used in air protection	2,06	1,00	**-1,06**

Source: Own study based on the findings of the survey, n=17; n - number of companies surveyed

Among the largest discrepancies in the competence gaps between the average value for all countries and Lithuania's performance was found: Selection of methods of atmospheric air protection against pollution (competence gap at -0.33 - all countries, competence gap at -0.82 - Lithuania), Action Planning for reduction of atmospheric emissions (gap at -0.31 - all countries, gap at -0.76 - Lithuania), Identification of techniques and technologies used in air protection (gap at -0.51 - all countries, gap at -1.06 - Lithuania) - Figure 54.

Figure 54: Specific competence gaps in the field of air protection - comparison with Lithuania

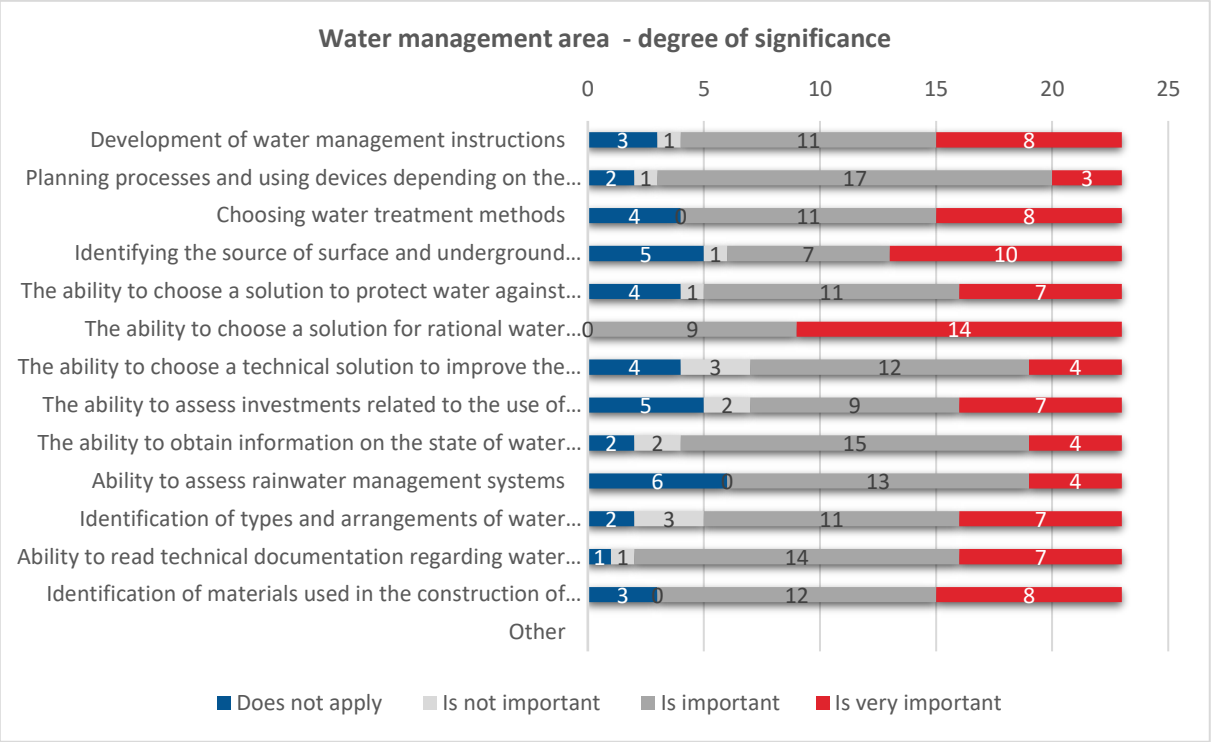


Source: Own study based on the findings of the survey, n=17; n - number of companies surveyed

5.1.3. Water management area

High importance is attributed to competences in the area of water management. Most of the skills were considered important or very important by over 70% of the surveyed companies (Figure 55). The highest were such competences as Ability to select a solution for rational water consumption (14 companies considered the competence to be very important, 9 - important), Ability to read technical documentation on water management (7 - very important, 14 - important), Recognition of materials used to build a water supply system (8 - very important, 12 - important), Planning processes and equipment depending on the purpose and chemical composition (3 - very important, 17 - important). High marks were also given to the development of water management instructions (8 - very important, 11 - important), The ability to obtain information on the condition of water resources, available types of surface and groundwater, types of water intakes (4 - very important, 15 - important), Selection of water treatment methods (8 - very important, 11 - important) or Identification of the source of surface and groundwater pollution (10 - very important, 7 - important).

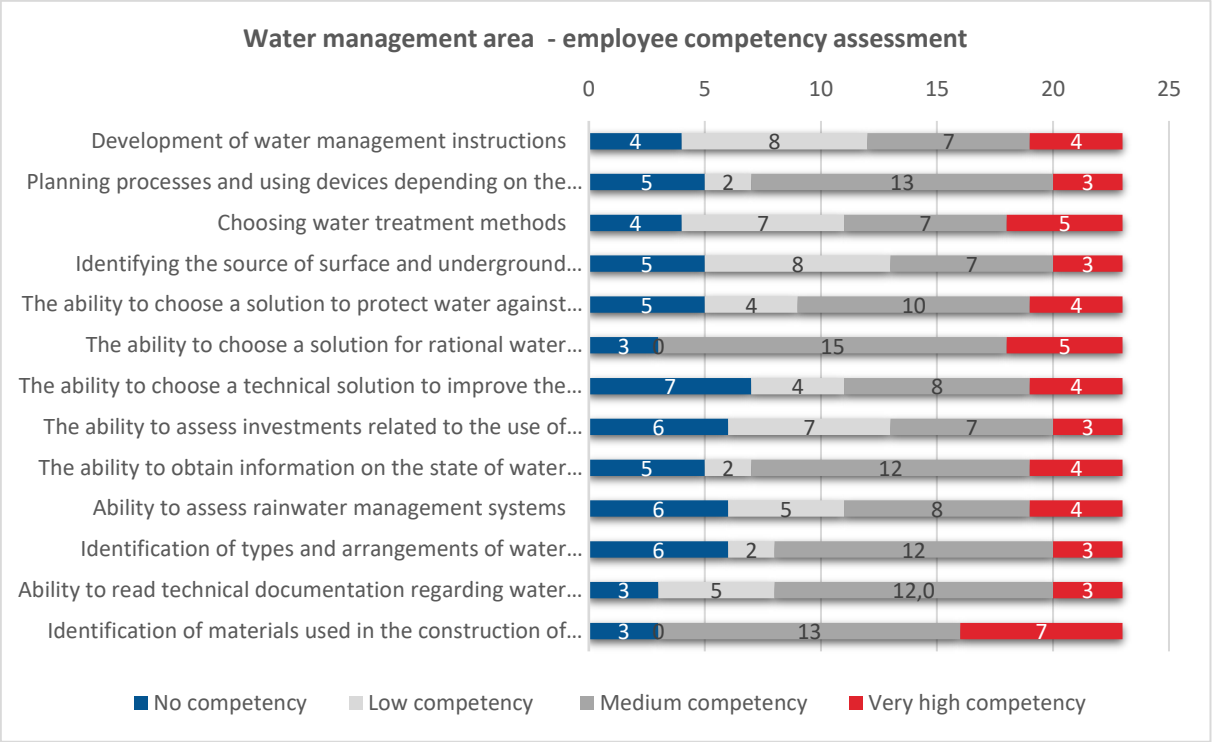
Figure 55: Level of relevance of competences in the field of water management - Lithuania



Source: Own study based on the findings of the survey, n=23; n - number of companies surveyed

The lowest level of competence of the employees of the surveyed companies in the area of water management concerns the ability to evaluate investments related to the use of groundwater resources (6 companies - lack of competence, 7 companies - low competence), Identifying the source of surface and groundwater pollution (5 - lack of competence, 8 - low competence) and Developing water management instructions (4 - lack of competence, 8 - low competence) - Figure 56.

Figure 56: Level of competence of employees in the field of water management - Lithuania



Source: Own study based on the findings of the survey, n=23; n - number of companies surveyed

The results of the conducted research indicate that the largest competence gaps in the area of water management concern the ability to choose a solution for rational water use (competence gap at level -0.65), Identification of surface and groundwater pollution source (gap at level -0.61), Development of water management instructions (gap at level -0.57) and the ability to read technical documentation on water management (gap at level -0.52). The level of gaps in individual competencies is shown in Table 13.

Table 13: Specific competence gaps in water management - Lithuania

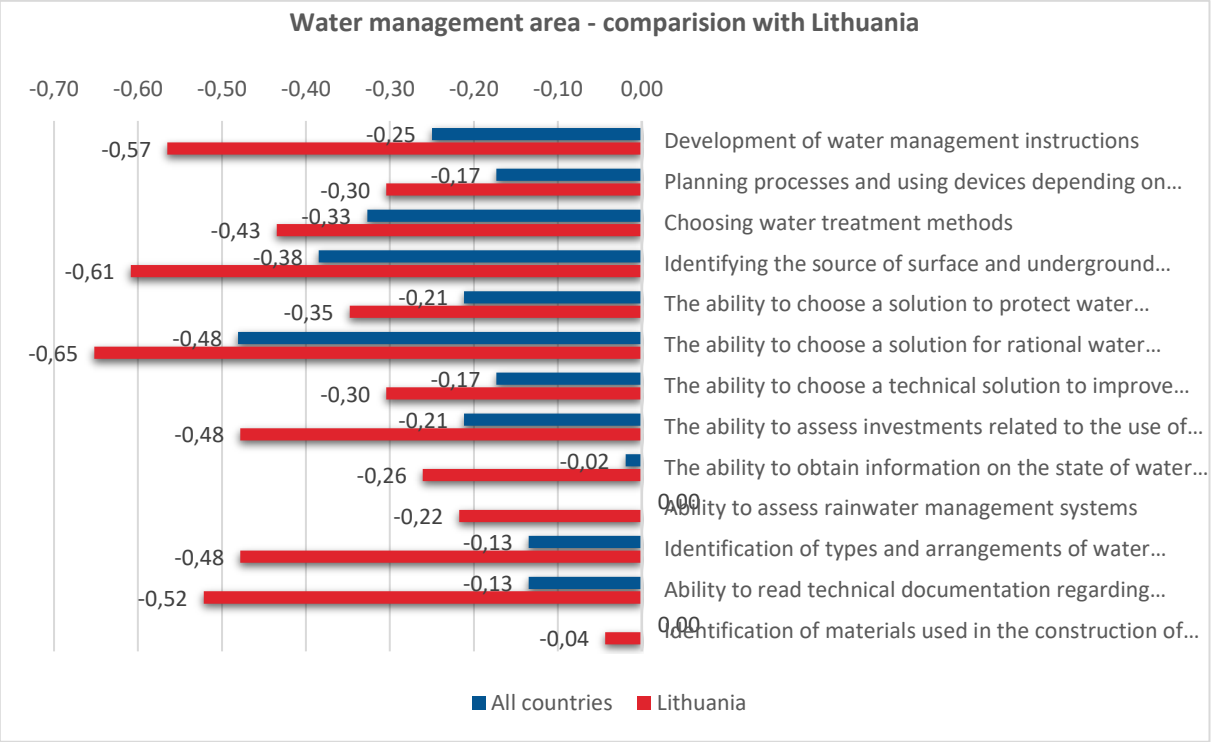
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Water management area	**1,98**	**1,58**	**-0,40**
1	Development of water management instructions	2,04	1,48	**-0,57**
2	Planning processes and using devices depending on the purpose and chemical composition	1,91	1,61	-0,30
3	Choosing water treatment methods	2,00	1,57	-0,43

4	Identifying the source of surface and underground water pollution	1,96	1,35	**-0,61**
5	The ability to choose a solution to protect water against secondary pollution	1,91	1,57	-0,35
6	The ability to choose a solution for rational water consumption	2,61	1,96	**-0,65**
7	The ability to choose a technical solution to improve the quality of captured water	1,70	1,39	-0,30
8	The ability to assess investments related to the use of groundwater resources	1,78	1,30	-0,48
9	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes	1,91	1,65	-0,26
10	Ability to assess rainwater management systems	1,65	1,43	-0,22
11	Identification of types and arrangements of water supply networks on the company's premises	2,00	1,52	-0,48
12	Ability to read technical documentation regarding water management	2,17	1,65	**-0,52**
13	Identification of materials used in the construction of plumbing	2,09	2,04	-0,04

Source: Own study based on the findings of the survey, n=23; n - number of companies surveyed

The biggest differences in the competence gaps between the aggregate results from the countries and Lithuania concern: Preparation of water management manuals (competence gap at level -0.25 - all countries, competence gap at level -0.57 - Lithuania), Ability to read technical documentation on water management (competence gap at level -0.13 - all countries, competence gap at level -0.48 - Lithuania), Identification of materials used for construction of water supply system (competence gap at level -0.13 - all countries, competence gap at level -0.52 - Lithuania) - Figure 57.

Figure 57: Specific competence gaps in water management - comparison with Lithuania

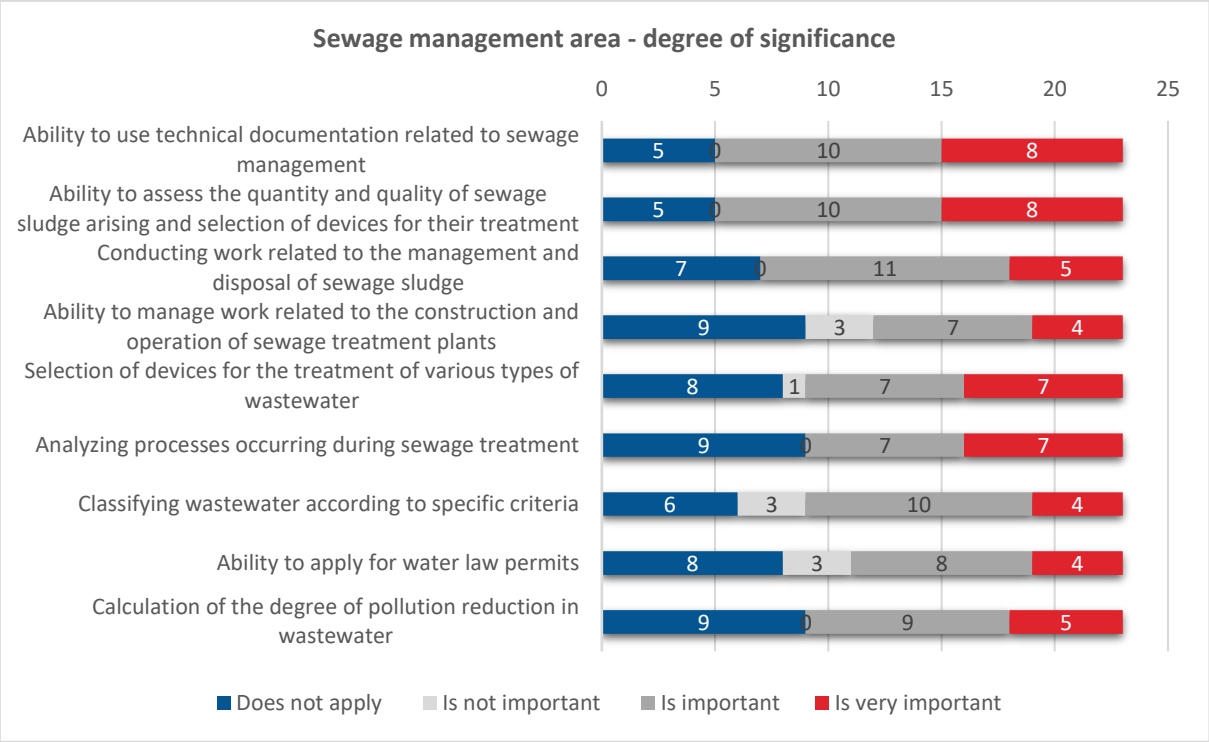


Source: Own study based on the findings of the survey, n=23; n - number of companies surveyed

5.1.4. Sewage management area

The majority of competences in the area of wastewater management were considered important or very important by more than half of the surveyed entrepreneurs (Figure 58). They attributed the greatest importance to such competences as Ability to use technical documentation related to sewage management (8 companies considered it very important and 10 companies considered it important), Ability to assess the quantity and quality of sewage sludge generated, selection of equipment for sewage sludge treatment (8 - very important, 10 - important), Conducting works related to sewage sludge management and disposal (5 - very important, 10 - important).

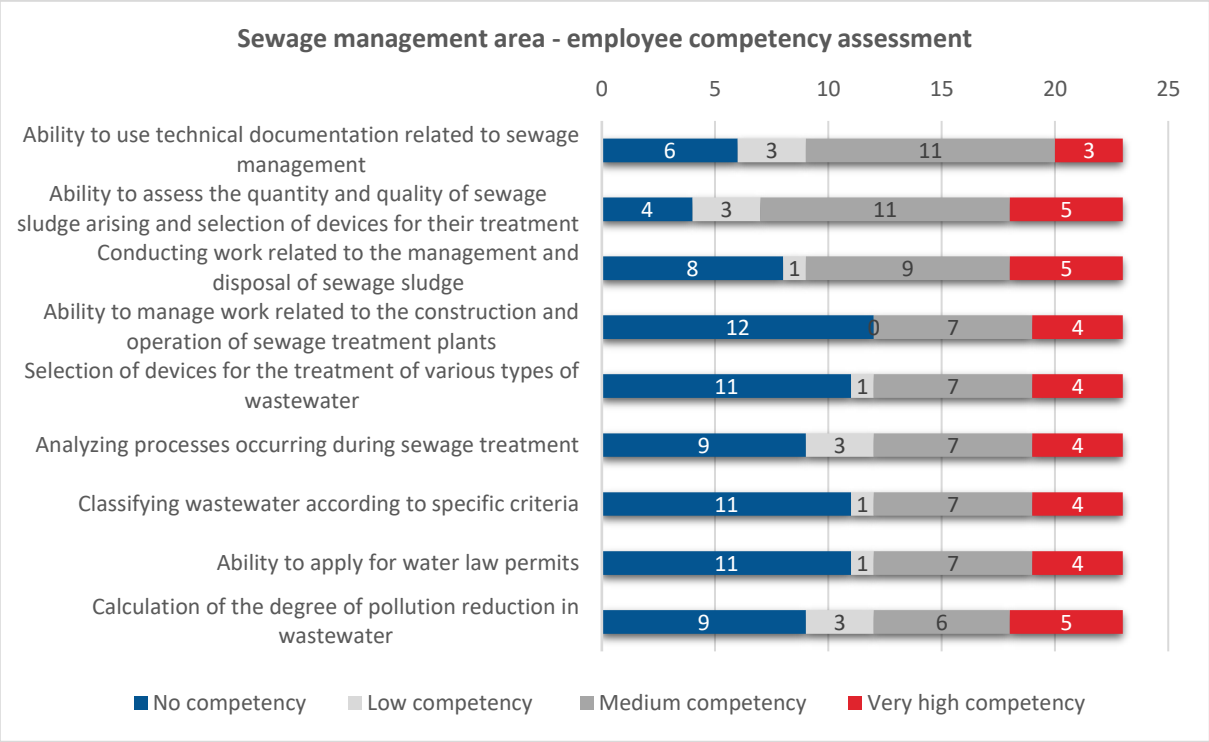
Figure 58: Level of relevance of competences in the field of wastewater management – Lithuania



Source: Own study based on the findings of the survey, n=23; n - number of companies surveyed

With regard to the level of competence of employees in the field of sewage management, the opinions of entrepreneurs varied and were distributed approximately in half, indicating low/total lack of competence or medium/high competence (Figure 59). The greatest discrepancies in the assessment concerned the Ability to manage works related to the construction and operation of sewage treatment plants, Selection of facilities for the treatment of various types of sewage, Analysis of processes occurring during sewage treatment, Classification of sewage according to specific criteria, Ability to apply for water-law permits, Calculation of pollution reduction in sewage. In the case of the remaining competences, more than half of the companies assessed the state of knowledge and skills of their employees in this area as medium or very high.

Figure 59: Employees' level of competence in the field of wastewater management - Lithuania



Source: Own study based on the findings of the survey, n=23; n - number of companies surveyed

In the area of wastewater management, there are rather high levels of competence gaps (Table 14). The largest deficits concerned the Ability to use technical documentation related to sewage management (competence gap at -0.43), Ability to assess the quantity and quality of sewage sludge generated, selection of equipment for sewage treatment (gap at -0.35), and Classification of sewage according to specific criteria (gap at -0.35).

Table 14: Specific competence gaps in sewage management - Lithuania

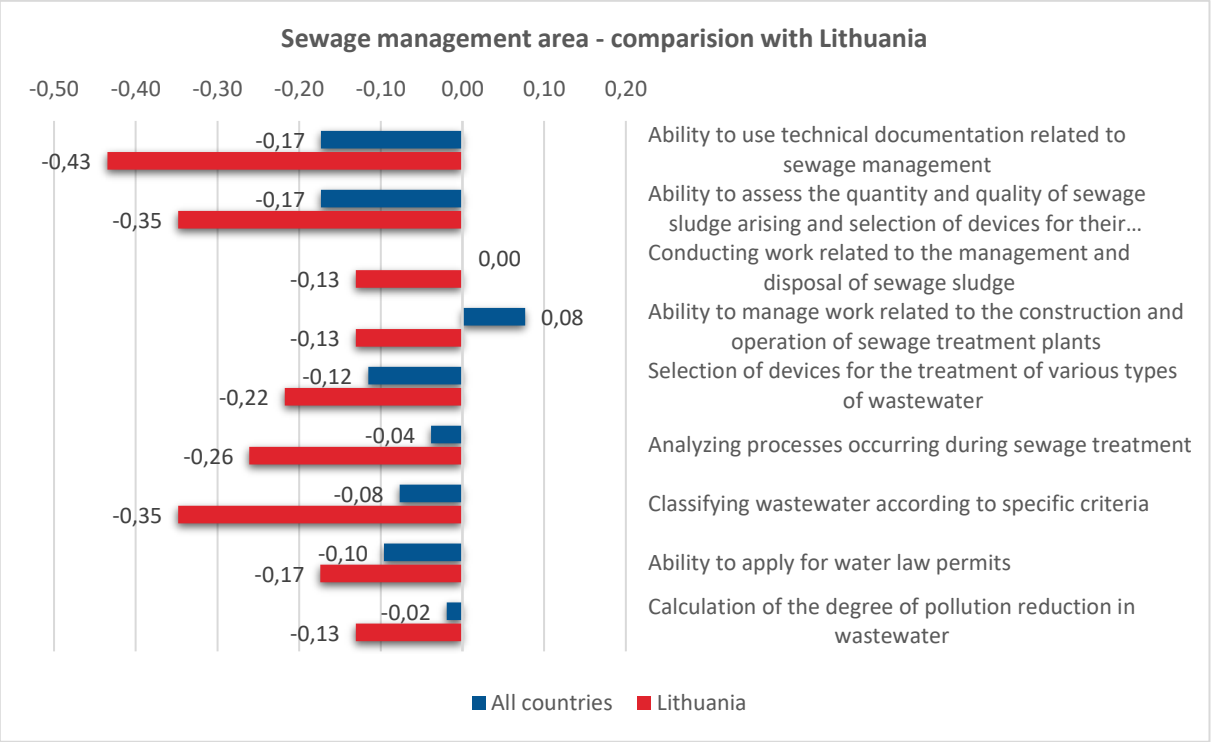
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Sewage management area	**1,57**	**1,32**	**-0,24**
1	Ability to use technical documentation related to sewage management	1,91	1,48	**-0,43**
2	Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment	1,91	1,57	**-0,35**

3	Conducting work related to the management and disposal of sewage sludge	1,61	1,48	-0,13
4	Ability to manage work related to the construction and operation of sewage treatment plants	1,26	1,13	-0,13
5	Selection of devices for the treatment of various types of wastewater	1,57	1,35	-0,22
6	Analyzing processes occurring during sewage treatment	1,52	1,26	-0,26
7	Classifying wastewater according to specific criteria	1,52	1,17	**-0,35**
8	Ability to apply for water law permits	1,35	1,17	-0,17
9	Calculation of the degree of pollution reduction in wastewater	1,43	1,30	-0,13

Source: Own study based on the findings of the survey, n=23; n - number of companies surveyed

The differences between the average gap values within all countries and those for Lithuania in particular concern: Ability to use technical documentation related to wastewater management (competence gap at -0.17 - all countries, competence gap at -0.43 - Lithuania), Analysing processes during wastewater treatment (-0.04, -0.26), Classification of wastewater according to specific criteria (competence gap at -0.08 - all countries, competence gap at -0.35 - Lithuania) - Figure 60.

Figure 60: Specific competence gaps in sewage management - comparison with Lithuania



Source: Own study based on the findings of the survey, n=23; n - number of companies surveyed

5.2. Experts' opinions on environmental management needs

The next stage of the study was qualitative interviews with experts in environmental management. In Lithuania, five experts were interviewed and asked questions about cost optimization in the field of environmental management, training in environmental management, use of renewable energy sources and competence needs related to environmental management.

5.2.1. Optimisation of environmental management costs in SME enterprises

The experts were asked about the importance of cost **optimization in the field of environmental management in enterprises of the SME sector**. According to the interlocutors, cost optimization in all areas is necessary: *optimization is necessary. Electricity is very important because the use is very high, wastewater is also very important because the costs are very high. Waste management costs, water costs are also high. The heating costs are average* [1EL]. However, as one of the surveyed persons noted, *if SMEs invest in solving environmental and management problems, it cannot be very cheap. You always need money. But if SMEs invest in training their employees, it can be beneficial because people find solutions to the environmental problems that exist in SMEs. Environmental problems always depend on the sector the SME deals with. Sometimes electricity is the main*

source of energy (for example in the textile industry), but water consumption is not a significant part of a company's costs. Therefore it is a very individual matter [2EL].

The second question in the qualitative study concerned **aspects of the green economy (e.g. electricity, waste, water, wastewater, heating), which should be the focus when planning educational programmes for SMEs.** Apart from a holistic approach covering all aspects of the green economy, there were suggestions that *waste, water and heating in the company are the most important. The importance also depends on the company's activities and the use of natural resources. Our company is responsible for collecting waste from the inhabitants of Panevezys. We collect waste using recycling bins. If people sort the waste, we can optimize our costs. More segregated waste would provide lower costs and a better environmental situation in the city* [4EL]. Furthermore, *the utility is different for different companies because it depends on the cost structure of the company, the amount and type of energy used. But education is always acceptable and very useful* [3EL].

5.2.2. Renewable energy sources

Another area raised was **the importance of using renewable energy sources (RES) in the SME sector**. *I think it is very important to use RES in the SME sector. But companies still feel a shortage of working capital to invest in these technologies. Besides, solar modules are not very effective because air conditions in Lithuania are not very suitable for solar energy. Heat pumps and biomass boilers are used for energy generation, and this kind of RES are more and more popular in the region* [1EL] - one of the respondents gave an opinion.

According to another expert, *each SME should choose its own solution, what kind of RES in SMEs can be acceptable. But training is very necessary to know what renewable energy sources can be used in SMEs. If a company can save money on the installed equipment for heat and electricity production, it helps to save money. We have examples of using RES in a company in the region. Some companies are satisfied, but others are not, because of the large investment in these technologies and quite a long payback period. As far as you know, SMEs always take into account its budget and possibilities. Of course there are many companies that care about environmental issues and are very socially responsible* [2EL].

Questions were also examined whether and if so, to what extent **training in renewable energy sources (RES)** for SMEs should be promoted (e.g. solar modules, heat pumps, solar collectors, biomass boilers). According to one of the interlocutors, *RES is our future. Therefore, all trainings for SME employees should be carried out. I personally, as a waste management professional, would pay attention to the management of RES in SMEs, analysing the actual situation and planning activities related to the use of RES. However, companies belong to different sectors by activity, which may be a different solution for RES use. The food and textile industries usually consume a lot of electricity. Perhaps service providers do not need much. In my opinion the training should be divided according to the KAIN method, but some general knowledge should also be added to the training programmes* [5EL].

Other proposals concerned *training in solar energy, heat pumps, biomass boilers - this would be very welcome* [3EL].

5.2.3. Assessing competence needs for environmental management

In the following part of the interview, experts were asked to assess **the specific competence needs related to environmental management in the SME sector.** They were supposed to consider which competences of SME employees in the field of **waste management** are important for the functioning of SME companies and which of them should be taken into account when planning educational programmes. In the opinion of one of the respondents, emphasis should be put on multidisciplinary training covering various aspects of waste management: *small companies usually employ a small number of people, they must be very versatile and have knowledge in various fields, including waste management and regulations in force in this country* [5EL].

There were also responses suggesting specific areas to be included in the training programmes. These included *classification of waste according to specific criteria, determination of conditions and methods of waste disposal, organization of waste collection and disposal, compliance with waste storage rules* [1EL], *waste sorting, choice of waste management method* [3EL], *choice of waste disposal methods* [4EL].

The experts also considered which **competences of employees in the field of air protection** are important from the point of view of operation of companies from the SME sector and worth taking into account when planning educational programmes. *I think that the training process and programs must be complex and include all persons* [5EL] - said one of the respondents. The training topics specified by the interviewees referred to *the organization of activities related to the monitoring of air pollution, identification of the source of air pollution, determination of the type and concentration of air pollution, selection of methods of air protection against pollution* [1EL], *preparation of the air pollution balance document, calculation of the degree of pollution reduction by waste gases* [4EL].

Another issue was the specific **competences of employees in the field of water management** and their relevance to the functioning of SME companies and planning of educational programmes. The respondents were not able to indicate single aspects, particularly important from the point of view of the functioning of companies and construction of training. They agreed that *all specific competences in the field of water management are important. I cannot determine which priority is first or last. I think that the training process and programs must be complex and involve all people* [5EL].

Similar answers have been given to the question of what **competences of employees in the field of wastewater management** are important for companies in the SME sector and for planning educational programmes. Again, experts postulated that *all competences are significant and should be taken into account when planning educational programmes* [3EL].

The last issue raised during the expert interviews was the **competence of employees in the field of recycling, circular economy and environmental management** taking into account their importance from the point of view of the functioning of companies from the SME sector and the creation of educational programmes. According to one of the respondents within the discussed area, *special emphasis should be put on knowledge and skills concerning preparation and reuse of consumables, knowledge on the selection and application of recycling techniques, knowledge and skills to use environmental economy in marketing and advertising, knowledge and skills for the development of new markets and areas of activity in the green economy* [1EL]. According to another expert, *SME employees and city citizens should first of all be informed and learn more about the benefits of*

wastewater management. Training and dissemination of relevant information will help to form an opinion on the actual situation in the field of local sewage management [4EL].

5.3. Examples of good practice in environmental management

The last stage of the conducted analyses was desk research, i.e. study of existing data, which consisted in the analysis of texts and materials available on the Internet describing examples of good practices in green education implemented in the country. The examples of good practices implemented in Lithuania are described below.

Green training for construction specialists[31]

The aim of the project, which was financed by the EU's Erasmus+ Leonardo da Vinci programme, was to develop and consolidate environmentally friendly (green) work culture in the construction sector while simultaneously improving the supply of qualified workforce for the industry, and creating opportunities for improving the skills of construction specialists in terms of green solutions. The project's activities covered the establishment of guidelines for trainers of construction specialists (sets of recommendations at the national, regional, and city level). The target group for the measure included teachers, trainers and researchers. It was assumed that in the long perspective, companies will be interested in hiring specialists on environmental construction. This stems from the drive in the construction sector to have a zero or minimum impact on the environment, and from the expected savings in the budgets of construction companies. These business needs form the basis for creating improved training for demanding professionals in construction. Moreover, the project also established training instruments for instructors in the construction sector. The target group for the measure included teachers, trainers and researchers. The objective behind creating the set of instructor training tools was to use them in specific modification/improvement of curricula and training methods. Finally, the project also developed training tools for construction professionals. The target group in this respect included students of vocational schools. The goal was to create a new programme for professionals working in the construction sector so that graduates who are already specialists in the industry could promote environmentally friendly culture and dominate the labour market. Project partners: 1. Vilnius College of Technology and Design (Lithuania); 2. Lithuania Construction Association (Lithuania); 3. Daugavpils Construction Technical School (Latvia); 4. Latvia Beekeeping Association (Latvia); 5. Järva County Vocational Education Centre (Estonia) 6. Inercia Digital SL (Spain).

Modular vocational training in Europe[32]

The participants of the project financed under the European Union's Erasmus+ Leonardo da Vinci programme included teachers and administrators involved in education and vocational training (practitioners and

[31] https://www.vjdrmc.lt, [access: 02.03.2020]
[32] https://www.klpvm.lt, [access: 02.03.2020]

managers) who are responsible for testing modular programmes and applying them effectively in the process of education. The project was intended to explore modular training practices of foreign partnership institutions (vocational training centres and schools), with a special focus on the organisation of the educational programme, student competence assessment, and modular grading; Using best practices adapted from foreign partners in testing and working with modular vocational training programmes in Lithuanian vocational schools; Strengthening the professional competences of teachers (planning and developing subject content, managing the teaching/learning process); Strengthening the managerial competences in terms of strategic thinking and management of change. Implemented mobility of teachers, specialists and managers of vocational education and training will have a direct impacct on the modernisation and organisation of curricula of Lithuanian vocational schools and training institutions after switching to modular education. The project was coordinated by the Technology Training Centre in Klaipeda. The project consortium consisted of: The Klaipeda School of Tourism. Project partners: Infeba Institut für Eurofisch Bildungsprogramme in Hamburg (Germany), Newservice societa coperativa sociale (Italy), The Practices s.l. ESMOVIA (Spain), Paragon Europe (Malta), Associacao de Mobilidade Intercultural Euromob (Portugal).

BFKK competencies to work

WWW&CE

Water, Waste Water, Waste & Circular Economy

Germany

Deutschland

Co-funded by the Erasmus+ Programme of the European Union

HANSE-PARLAMENT
Network for Small and Medium Enterprises

WWW&CE

Germany

Research in Germany was conducted by the Hanseatic Parliament. Seven companies operating in Germany took part in the survey. 4 of them are small enterprises and the remaining 3 are microenterprises. 3 of the 7 companies are related to service, social and individual activities, 2 are involved in business, real estate, the rest are active in industry and trade and repairs.). This chapter presents German good practice in the development of green competence: Waste Education Initiative (Waste EI)- a waste education initiative; LeKoKli - a municipality as a place of learning for sustainable development; Education for sustainable development in social work with young people.

Germany Deutschland

Co-funded by the Erasmus+ Programme of the European Union

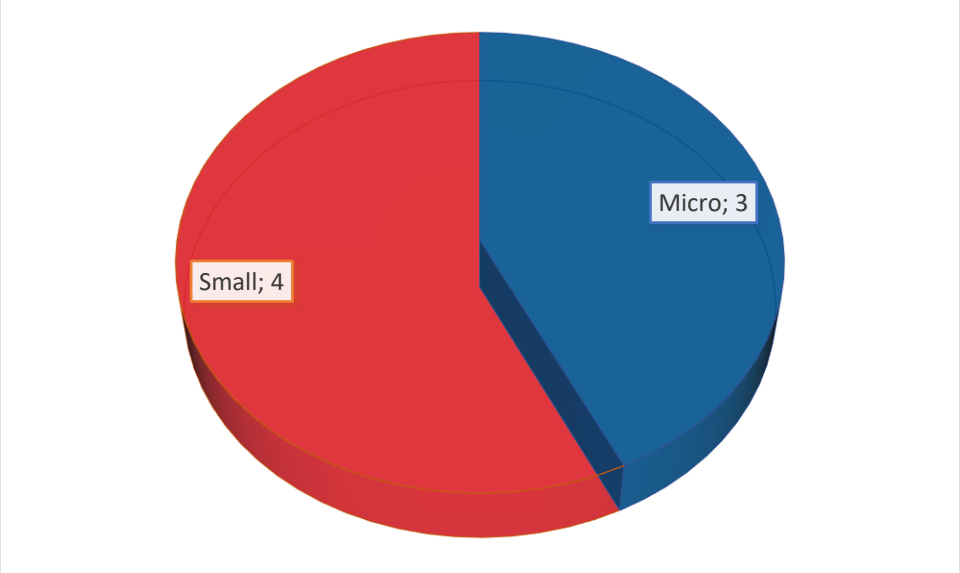
HANSE-PARLAMENT
Network for Small and Medium Enterprises

6. Germany

6.1. Results of quantitative studies on environmental management needs

The survey involved 7 companies operating in Germany. 4 of them are small enterprises and the remaining 3 are microenterprises (Figure 61).

Figure 61: Company size - Germany



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

3 out of 7 companies are related to service, social and individual activities, 2 are involved in the service of companies, real estate, the rest are active in industry and trade and repairs. (Figure 62).

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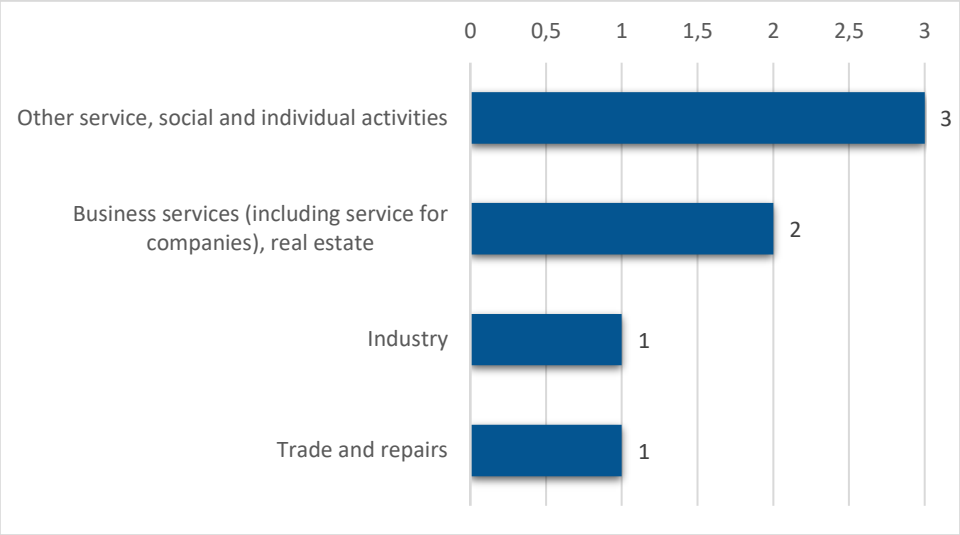
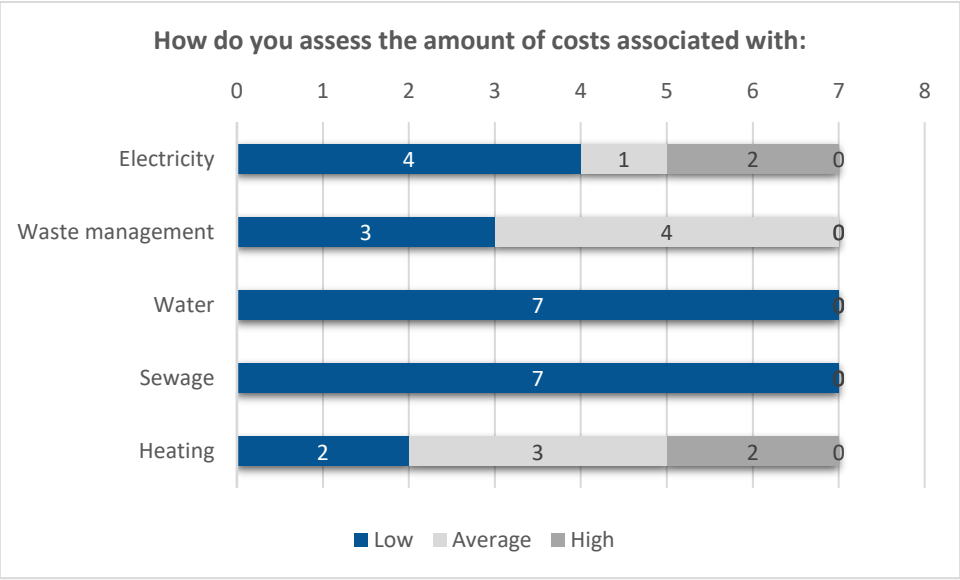
Figure 62: Main activity of the company - Germany



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

Entrepreneurs were asked to assess the amount of costs related to electricity, waste, water, sewage and heating in relation to the total cost of the company (Figure 63). Most of the answers leaned towards statements of low or average costs. According to all surveyed companies, the costs incurred in water consumption and sewage production are low. In the opinion of 4 out of 7 companies, costs related to electricity are also low. Two of the replies indicating high costs related to electricity and heating.

Figure 63: Costs incurred – Germany



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

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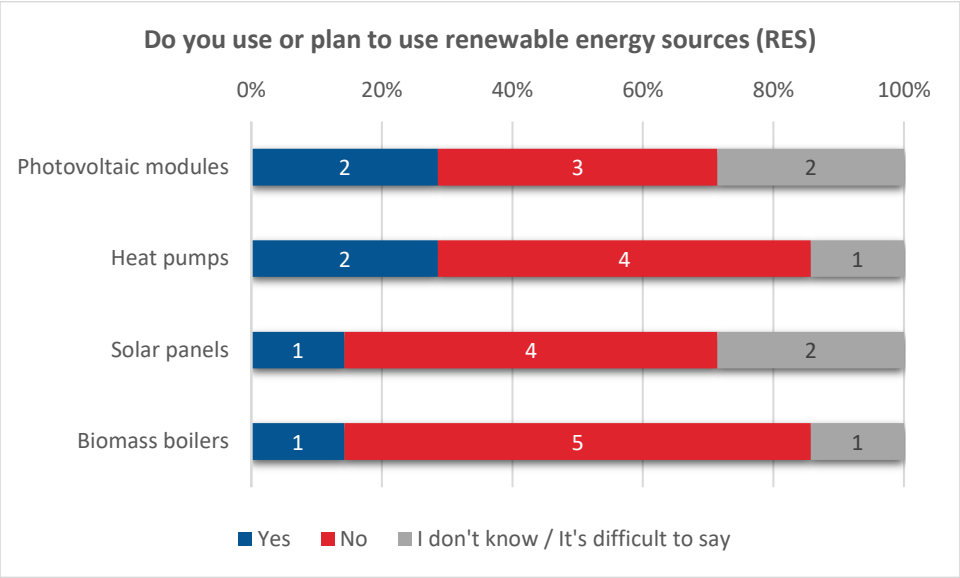
In response to the question about the use of renewable energy sources (RES) and their planned introduction in the future, the majority of entrepreneurs stated that RES are not and will not be used or were not able to answer (Figure 64). Two affirmative answers each concerned photovoltaic modules and heat pumps.

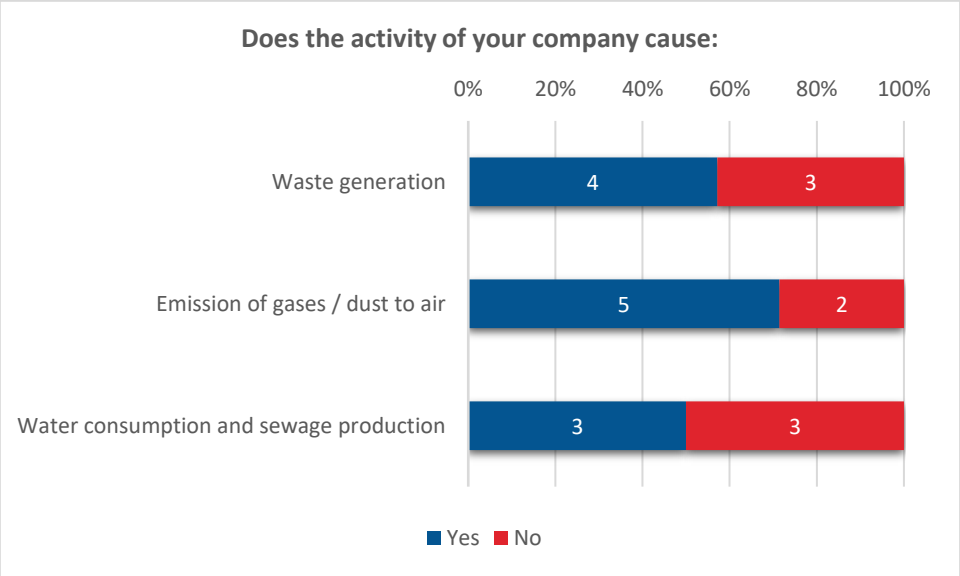
Figure 64: Use of renewable energy sources in companies - Germany



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

A filtering question was used in the research questionnaire in order to identify possible types of pollution produced by the surveyed companies, which subsequently allowed to identify areas requiring detailed analysis in terms of competence needs in environmental management. On this basis, companies that produce waste (4 surveyed companies), emit gases and dust into the air (5 companies) and use water and produce sewage (3 companies) were identified - Figure 65.

Figure 65: Types of pollution generated by companies in their business activity - Germany



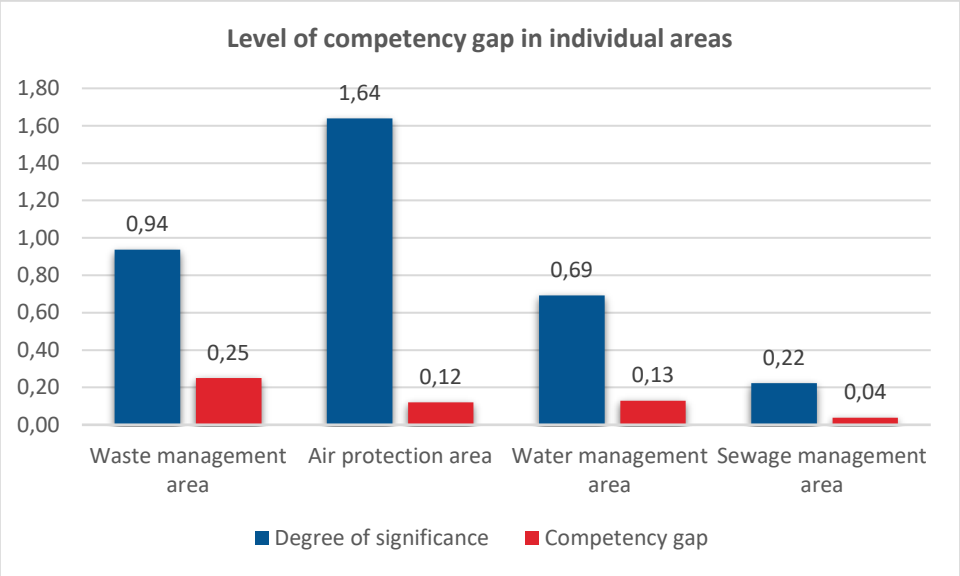
Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

Within the identified areas, the surveyed entrepreneurs were asked to assess the degree of significance of particular competences related to environmental economy from the point of view of the specificity of their company's operations, on a scale from 0 to 3 (where 0 means that a given competence does not concern their company, 1 - is not important, 2 - is important, 3 - is very important) and on a similar scale, to assess the current state of competences possessed by employees (where 0 means lack of competences, 1 - low competences, 2 - medium competences, 3 - very high competences).

The questions concerning competence needs in particular areas 1) waste, 2) emission of gases and dusts into the air, 3) water consumption and sewage production were answered only by those companies which declared that they use a given environmental aspect.

The area which, in the opinion of entrepreneurs participating in the survey, is the most significant was air protection, whose significance was at the level of 1.64 (Figure 66). However, what is important, none of the discussed areas was considered by German companies to be in short supply in terms of the current state of knowledge of employees. Within all areas, the value of the competence gap was assessed positively, which means that the employees' knowledge is, in the opinion of the respondents, slightly higher than the companies' demand.

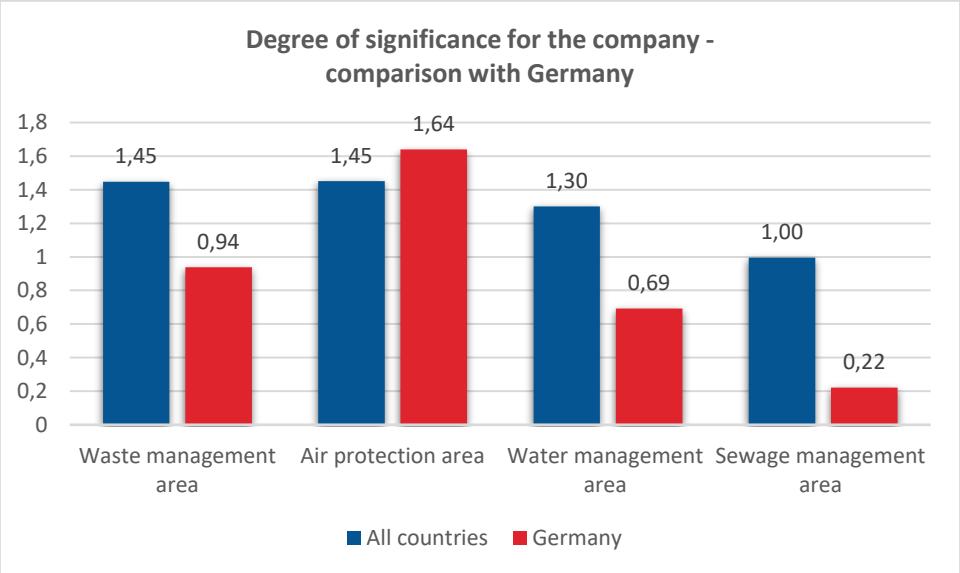
Figure 66: Level of competence gap in individual areas - Germany



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

The German companies participating in the study rated the level of relevance of air protection competence at 1.64 (Figure 67). Slightly lesser significance was shown in relation to all countries (at 1.45). The biggest difference in the perception of materiality is seen in the area of wastewater management, where the overall assessment of all countries was 1.00 and the German framework was only 0.22.

Figure 67: Level of relevance of competences - comparison with Germany



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

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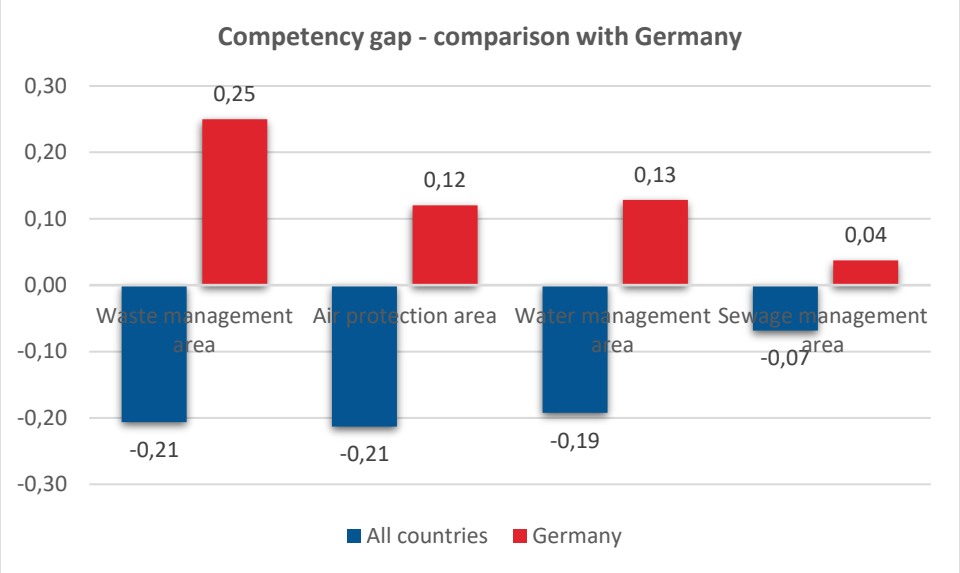
In the case of Germany, too, entrepreneurs rated the skills of their employees highly, which resulted in a positive level of competence gaps. Competence in waste management was rated best - at 0.25 (Figure 68). At the same time, this is one of the areas where the aggregate results from the countries indicate the largest negative gap at the level of -0.21.

Figure 68: Level of competence gap in individual areas – comparison with Germany

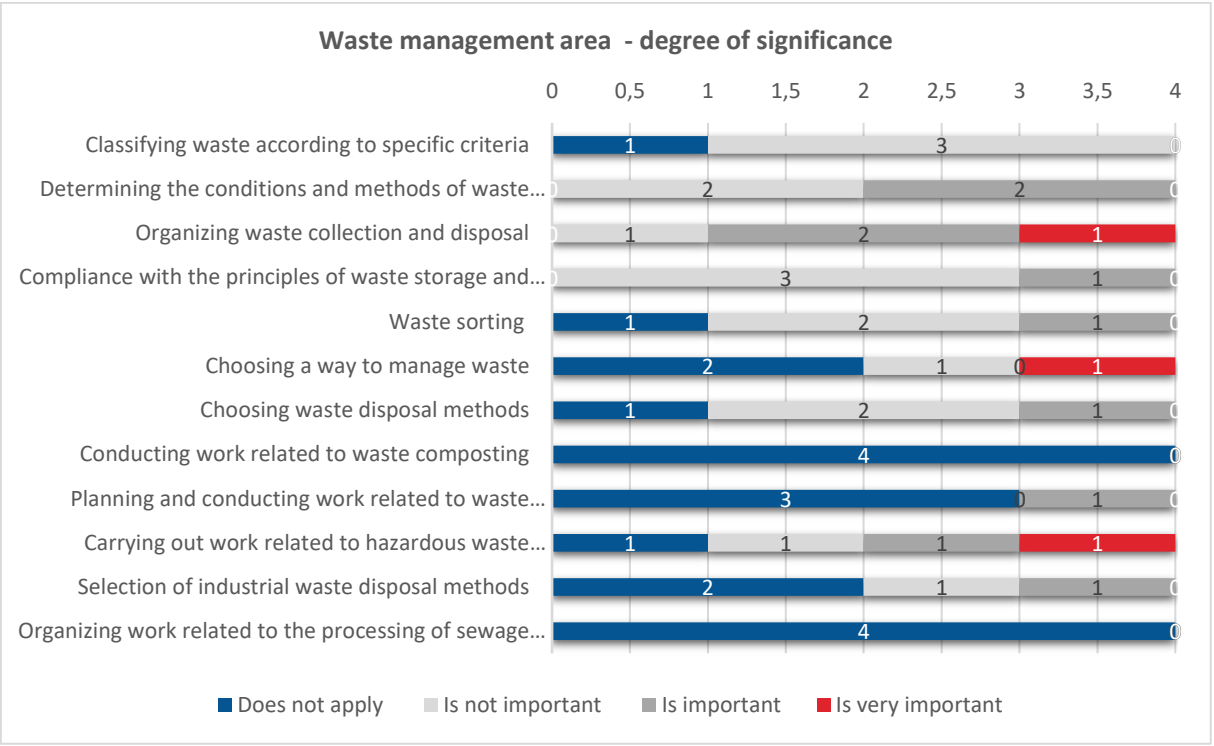


Source: Own study based on the findings of the survey, n=99; n – number of companies surveyed

6.1.1. Waste management area

In the area of waste management, the competences that most companies consider important or very important are: Organizing waste collection and disposal (2 companies considered this competence important and 1 company considered it very important), Conducting works related to hazardous waste management (1 company - important, 1 company - very important), Determining conditions and methods of waste disposal (2 companies - important). The lowest significance was attributed to Classification of waste according to specific criteria and Observance of the principles of waste storage and warehousing - this response was provided by 3 companies (Figure 69). It should be noted, of course, that due to the small number of the surveyed companies, the sample is not representative and the above mentioned opinion concerns the companies that participated in the survey.

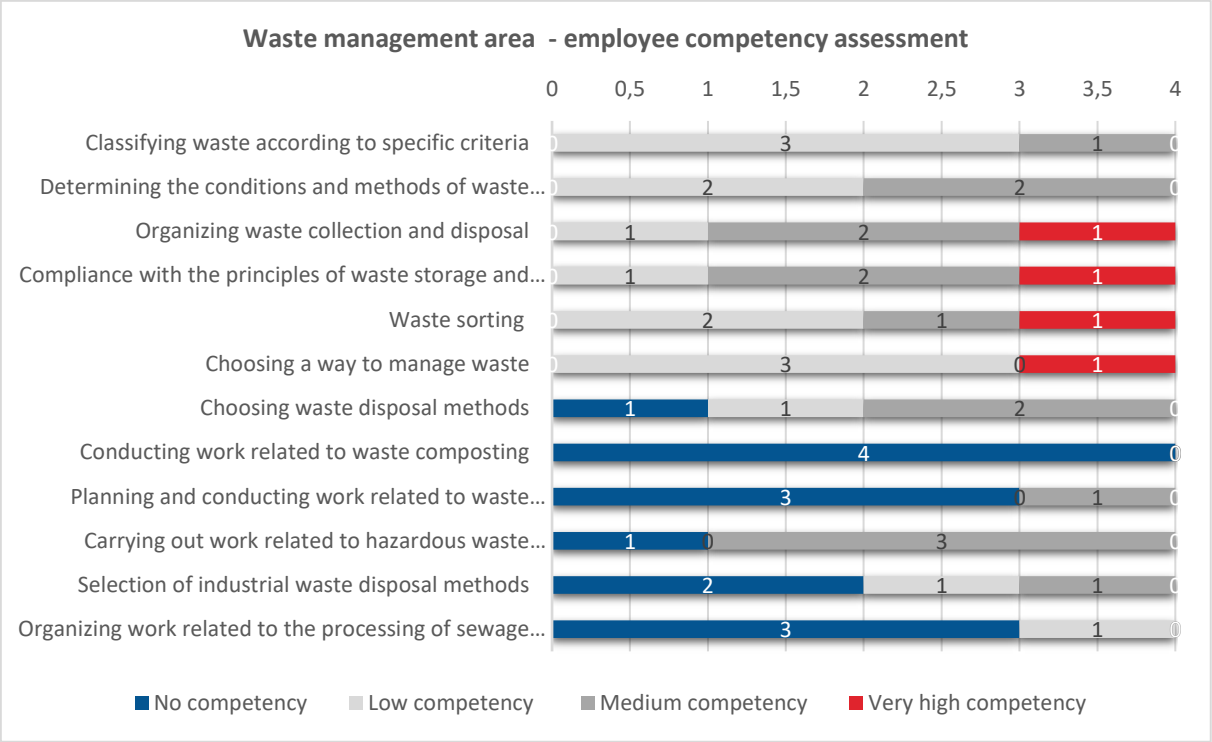
Figure 69: Level of relevance of waste management competences - Germany



Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

In the area of waste management, the level of competence of employees varies greatly within the individual skills (Figure 70). Medium or high competences concern Organising waste collection and collection (1 company - very high competences, 2 companies - medium competences), Observing the rules of waste storage and storage (1 company - very high competences, 2 companies - medium competences), Conducting works related to the management of hazardous waste (3 companies - medium competences). The largest number of companies participating in the survey is convinced of the low level of competence in carrying out works related to waste composting (4 companies), Organizing works related to sewage sludge treatment and equipment operation (3 companies) and Planning and carrying out works related to waste incineration and plant operation (3 companies).

Figure 70: Level of competence of employees in the field of waste management - Germany



Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

Table 15 presents detailed data on the level of competence gaps in relation to waste management skills. As indicated by the data contained in the table, the competences in the area of waste management are not in short supply in terms of the state of the employees' knowledge compared to the relevance of the skills concerned. In all cases, the value of competence gaps was positive, which means that the knowledge of employees is, in the opinion of the respondents, higher than the demand of enterprises.

Table 15: Specific competence gaps in waste management - Germany

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Waste management area	**0,94**	**1,19**	**0,25**
1	Classifying waste according to specific criteria	0,75	1,25	0,50
2	Determining the conditions and methods of waste disposal	1,50	1,50	0,00
3	Organizing waste collection and disposal	2,00	2,00	0,00

4	Compliance with the principles of waste storage and storage	1,25	2,00	0,75
5	Waste sorting	1,00	1,75	0,75
6	Choosing a way to manage waste	1,00	1,50	0,50
7	Choosing waste disposal methods	1,00	1,25	0,25
8	Conducting work related to waste composting	0,00	0,00	0,00
9	Planning and conducting work related to waste incineration and operation of incineration plants	0,50	0,50	0,00
10	Carrying out work related to hazardous waste management	1,50	1,50	0,00
11	Selection of industrial waste disposal methods	0,75	0,75	0,00
12	Organizing work related to the processing of sewage sludge and the operation of equipment	0,00	0,25	0,25

Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

None of the competence gaps concerning Germany were negative. The biggest difference between the opinion of German companies and the average result for all countries was visible in the following skills: Compliance with landfill and storage rules (gap at -0.12 - all countries, gap at 0.75 - Germany), Waste sorting (gap at -0.12 - all countries, gap at 0.75 - Germany), Waste management selection (gap at -0.40 - all countries, gap at 0.50 - Germany) - Figure 71.

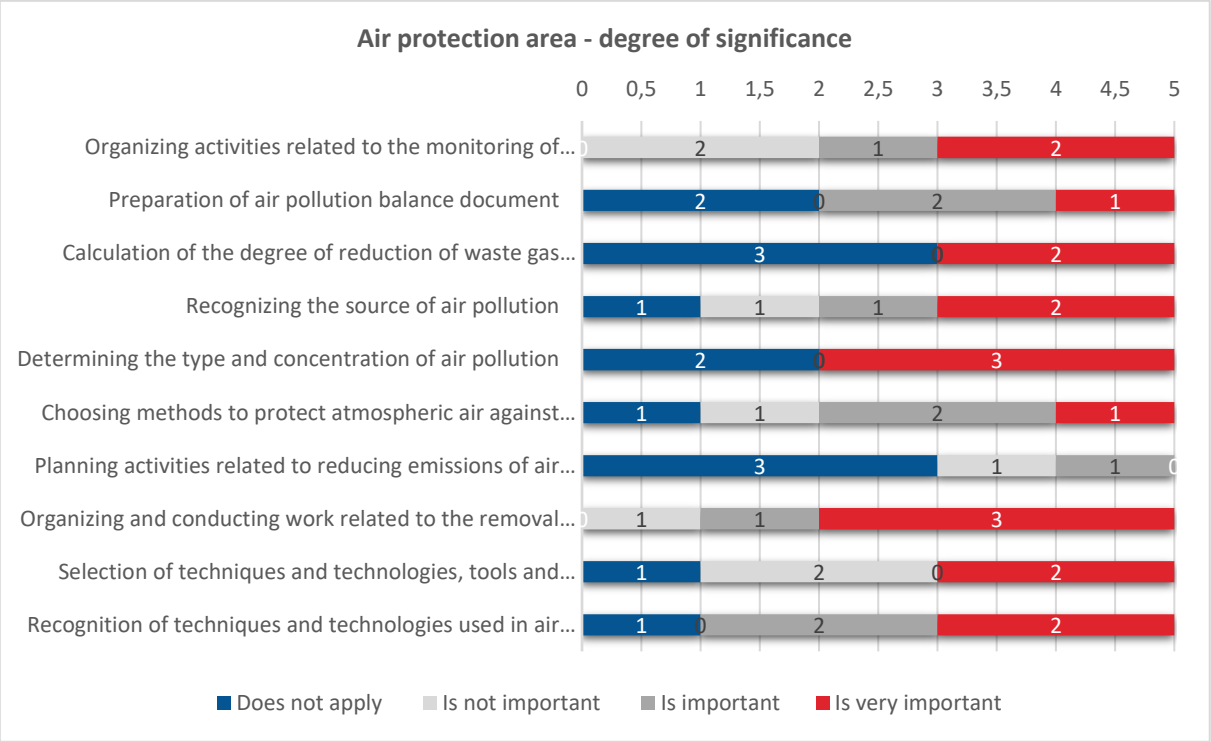
Figure 71: Specific competence gaps in waste management - comparison with Germany

Source: Own study based on the findings of the survey, n=4; n - number of companies surveyed

6.1.2. The air protection area

In the most important area, which is air protection, the answers indicate that the surveyed companies assign the greatest importance to the organization and conduct of works related to the removal of pollutants from the air (3 - very important, 1 - important), Identification of techniques and technologies used in air protection (2 - very important, 2 - important) and Determination of the type and concentration of air pollutants (3 - very important) - Figure 72.

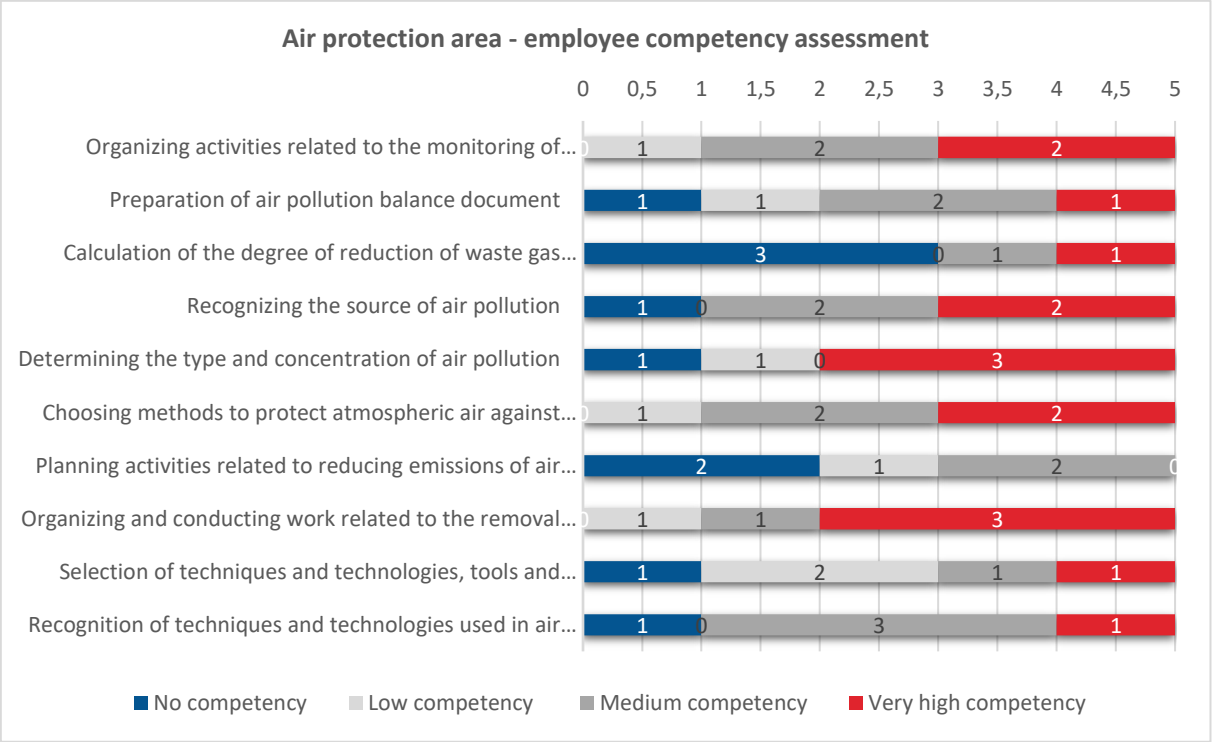
Figure 72: Level of relevance of competences in the field of air protection - Germany



Source: Own study based on the findings of the survey, n=5; n - number of companies surveyed

Entrepreneurs when asked about the level of competence of employees in the field of air protection, the least appreciated the skills associated with calculating the degree of reduction of waste gas pollution - 3 companies indicated a lack of competence of employees in this area (Figure 73). The best rating was given to the organization and conduct of works related to the removal of air pollutants from the atmosphere (3 companies - very high competence, 1 company - medium competence) and determining the type and concentration of air pollutants (3 companies - very high competence).

Figure 73: Employees' level of competence in the field of air protection - Germany



Source: Own study based on the findings of the survey, n=5; n - number of companies surveyed

Table 16 presents data on specific competence gaps in air protection skills. The analysis of the results shows that in most cases the gaps have reached a positive level, which means that the knowledge of the employees is in the opinion of the respondents higher than the demand of enterprises. The only competence gaps that were at the level of -0.20 were recorded in the calculation of the degree of reduction of waste gas pollution, Selection of techniques and technologies, tools and materials for air purification depending on the properties of the removed pollutants and process conditions, Identification of techniques and technologies used in air protection.

Table 16: Specific competence gaps in the field of air protection - Germany

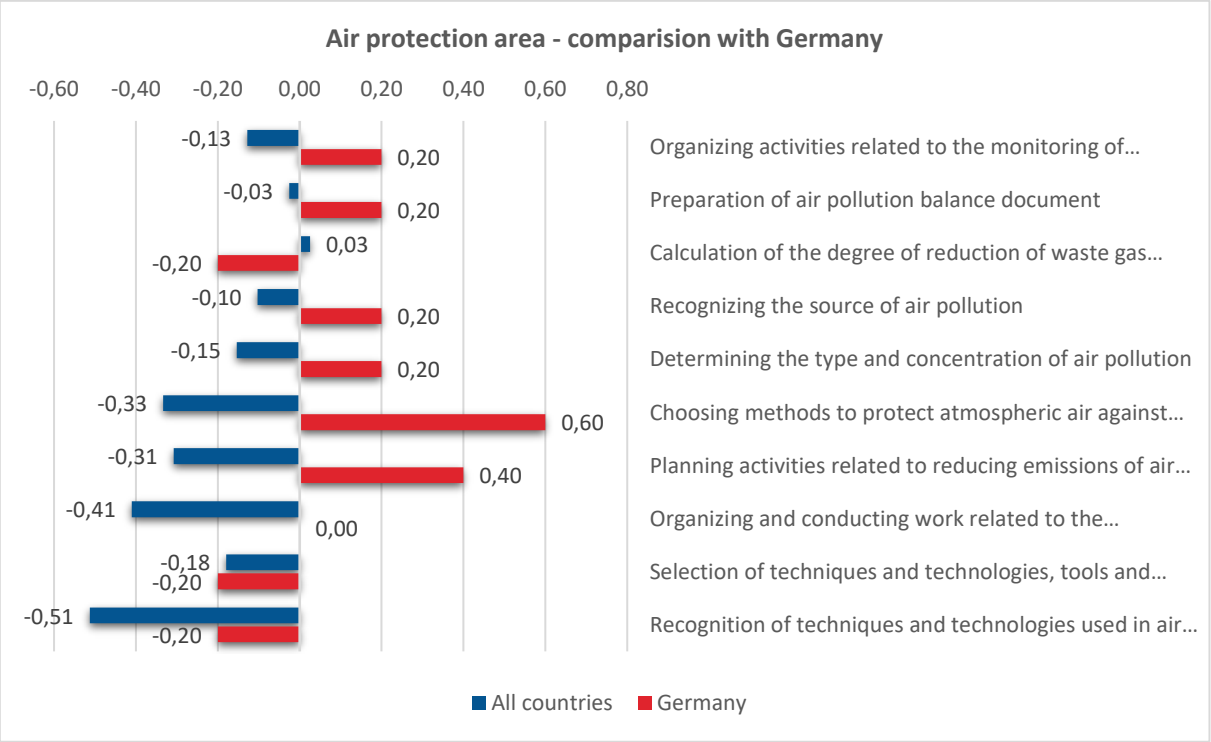
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Air protection area	**1,64**	**1,76**	**0,12**
1	Organizing activities related to the monitoring of atmospheric air pollution	2,00	2,20	0,20
2	Preparation of air pollution balance document	1,40	1,60	0,20

3	Calculation of the degree of reduction of waste gas impurities	1,20	1,00	**-0,20**
4	Recognizing the source of air pollution	1,80	2,00	0,20
5	Determining the type and concentration of air pollution	1,80	2,00	0,20
6	Choosing methods to protect atmospheric air against pollution	1,60	2,20	0,60
7	Planning activities related to reducing emissions of air pollutants	0,60	1,00	0,40
8	Organizing and conducting work related to the removal of atmospheric pollution	2,40	2,40	0,00
9	Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions	1,60	1,40	**-0,20**
10	Recognition of techniques and technologies used in air protection	2,00	1,80	**-0,20**

Source: Own study based on the findings of the survey, n=5; n - number of companies surveyed

The competence gaps concerning Germany were mostly positive and therefore many differences from the aggregate values appeared (Figure 74). First of all, they concerned: Selection of methods of atmospheric air protection against pollution (competence gap at the level of -0.33 - all countries, competence gap at the level of 0.60 - Germany) and Action Planning related to reduction of atmospheric emissions (competence gap at the level of -0.31 - all countries, competence gap at the level of 0.40 - Germany).

Figure 74: Specific competence gaps in the field of air protection – comparison with Germany

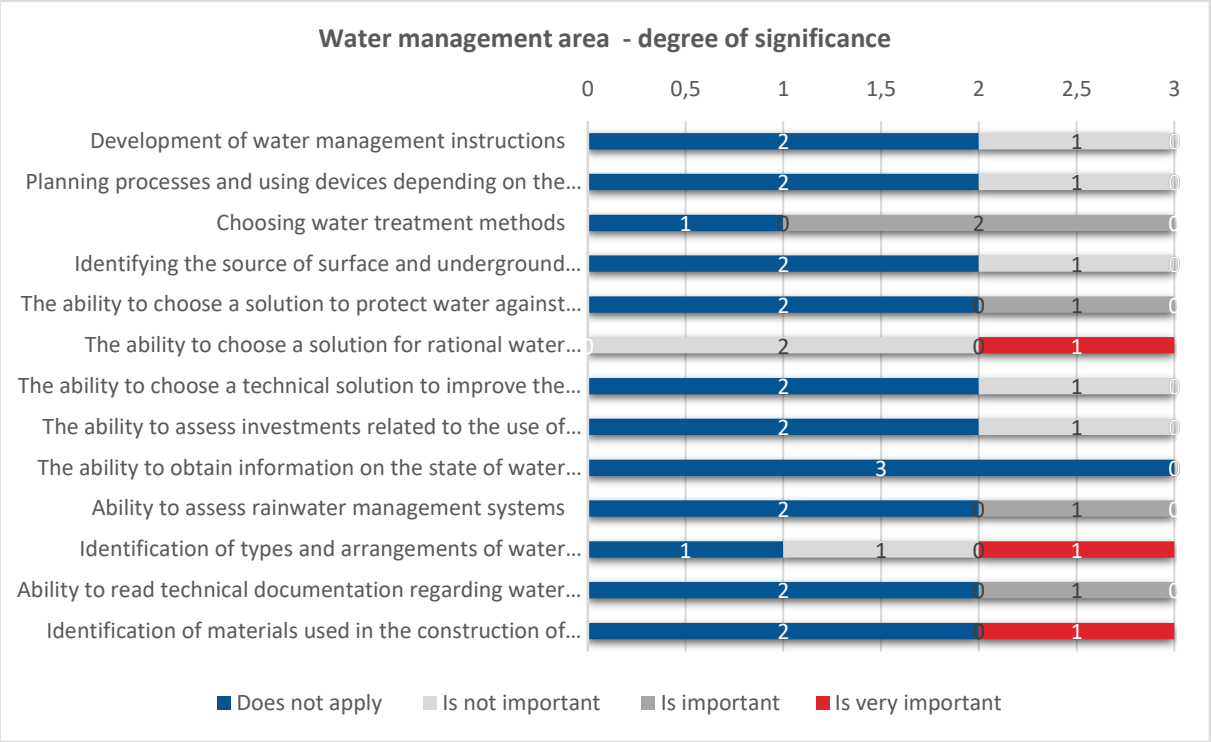


Source: Own study based on the findings of the survey, n=5; n – number of companies surveyed

6.1.3. Water management area

Low importance is attributed to competences in the area of water management (Figure 75). Most of the competences were considered irrelevant or insignificant from the company's point of view. The only skills relevant for 2 companies are Water Treatment Methods. One company each considered it very important: The ability to select a solution for rational water consumption, Recognizing types and systems of water supply systems on the company premises, Recognizing materials used to build a water supply system.

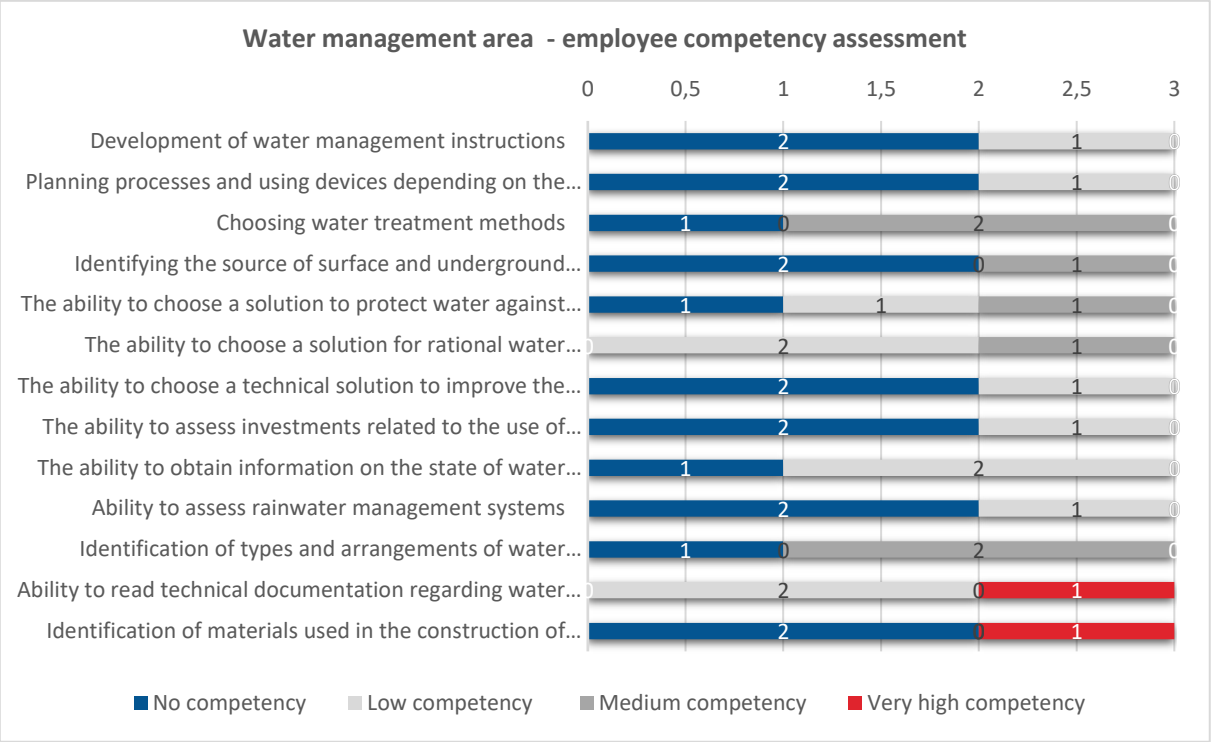
Figure 75: Level of relevance of competences in the field of water management - Germany



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

The lowest level of competence of the employees of the surveyed companies in the area of water management concerns the development of water management instructions (2 companies - lack of competence, 1 company - low competence), Planning processes and equipment depending on the purpose and chemical composition (2 companies - lack of competence, 1 company - low competence), Ability to select a technical solution to improve the quality of water intake (2 companies - lack of competence, 1 company - low competence), Ability to evaluate investments related to the use of groundwater resources (2 companies - lack of competence, 1 company - low competence), Ability to evaluate rainwater management systems (2 companies - lack of competence, 1 company - low competence). Individual answers indicating very high competences concerned the ability to read technical documentation concerning water management and to recognize materials used for the construction of a water supply system (Figure 76).

Figure 76: Level of competence of employees in the field of water management - Germany



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

The results of the conducted research indicate that small competence gaps in the area of water management concern the ability to choose a solution for rational water use, the ability to evaluate rainwater management systems (competence gaps at the level of -0.33) - Table 17.

Table 17: Specific competence gaps in water management - Germany

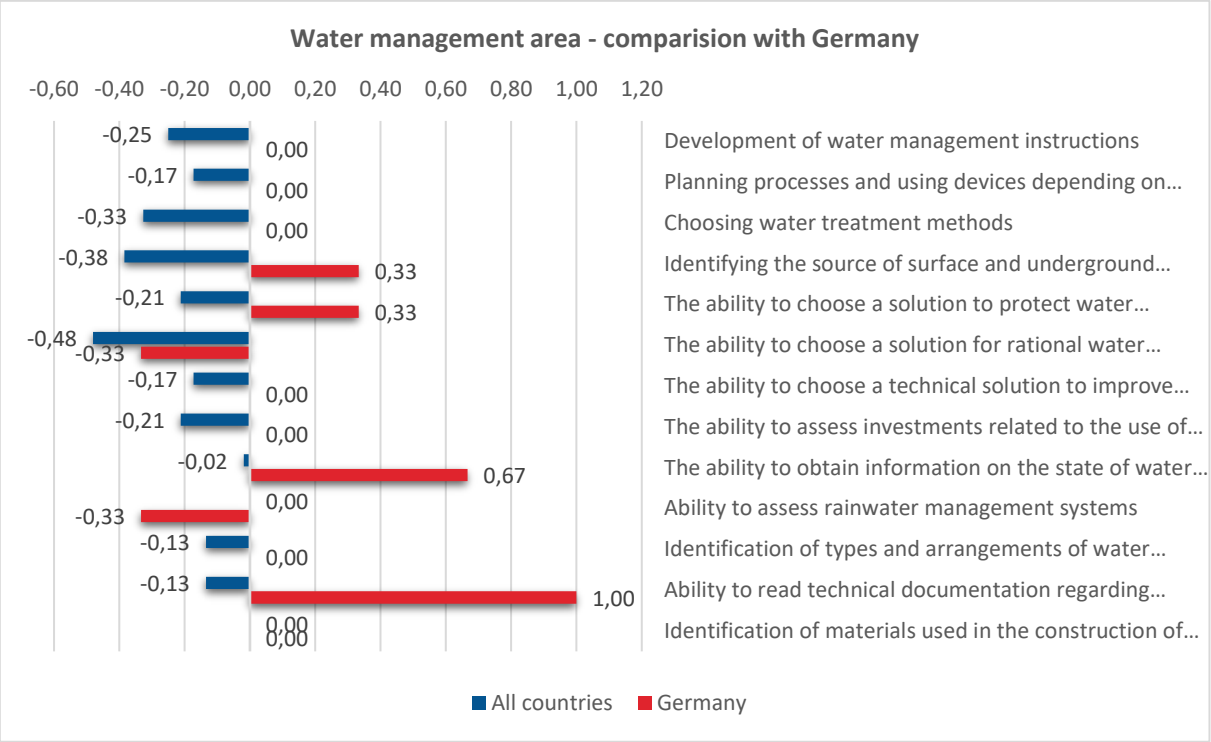
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Water management area	**0,69**	**0,82**	**0,13**
1	Development of water management instructions	0,33	0,33	0,00
2	Planning processes and using devices depending on the purpose and chemical composition	0,33	0,33	0,00
3	Choosing water treatment methods	1,33	1,33	0,00

4	Identifying the source of surface and underground water pollution	0,33	0,67	0,33
5	The ability to choose a solution to protect water against secondary pollution	0,67	1,00	0,33
6	The ability to choose a solution for rational water consumption	1,67	1,33	**-0,33**
7	The ability to choose a technical solution to improve the quality of captured water	0,33	0,33	0,00
8	The ability to assess investments related to the use of groundwater resources	0,33	0,33	0,00
9	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes	0,00	0,67	0,67
10	Ability to assess rainwater management systems	0,67	0,33	**-0,33**
11	Identification of types and arrangements of water supply networks on the company's premises	1,33	1,33	0,00
12	Ability to read technical documentation regarding water management	0,67	1,67	1,00
13	Identification of materials used in the construction of plumbing	1,00	1,00	0,00

Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

The companies surveyed in Germany rated the skills of their employees highly for several qualifications and therefore the competence gaps reached a positive value (Figure 77). For this reason, there were large discrepancies in relation to the averages across countries. Among them, they stood out the most: Identification of the source of surface and groundwater pollution (competence gap at the level of -0.33 - all countries, competence gap at the level of 0.33 - Germany), Ability to obtain information on the state of water resources, available types of surface and groundwater, Types of water intakes (competence gap at -0.02 - all countries, competence gap at 0.67 - Germany) and Identification of materials used for building a water supply system (competence gap at -0.13 - all countries, competence gap at 1.00 - Germany).

Figure 77: Specific competence gaps in water management - comparison with Germany



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

6.1.4. Sewage management area

The vast majority of competences in the area of sewage management were considered by the surveyed entrepreneurs to be irrelevant or insignificant (Figure 78). The only skill that was considered important by one company was the ability to use technical documentation related to sewage management.

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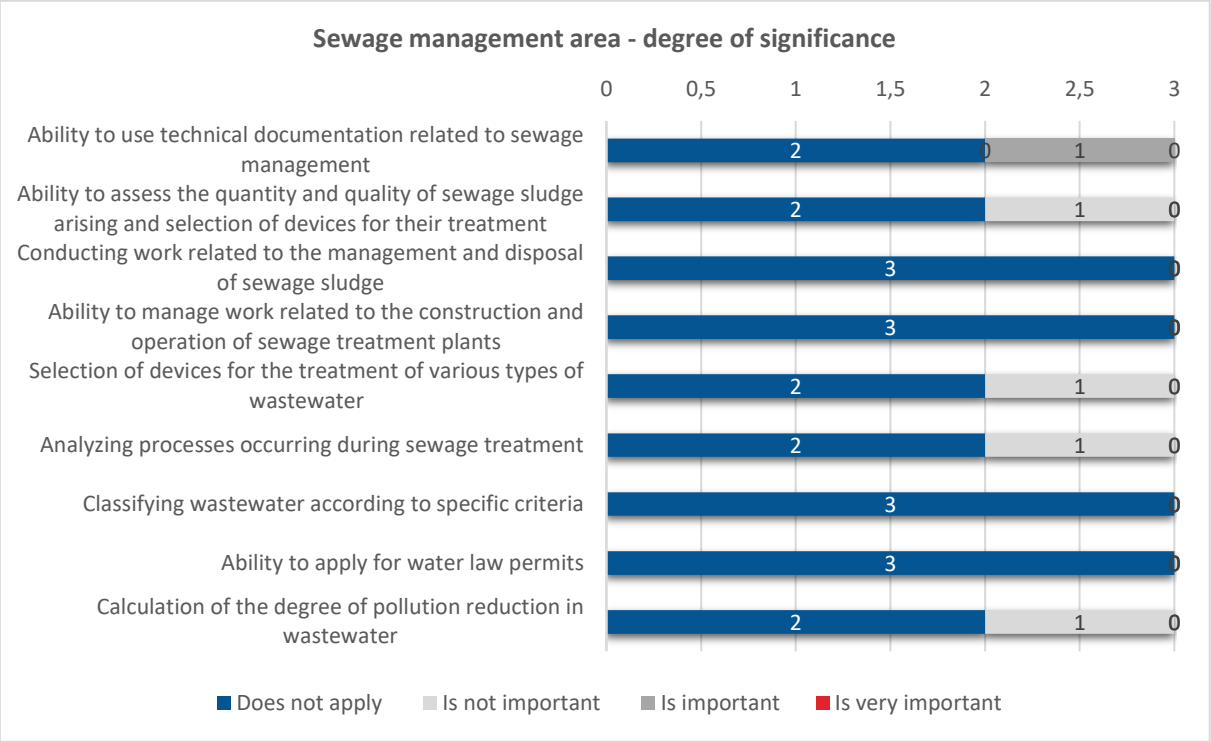
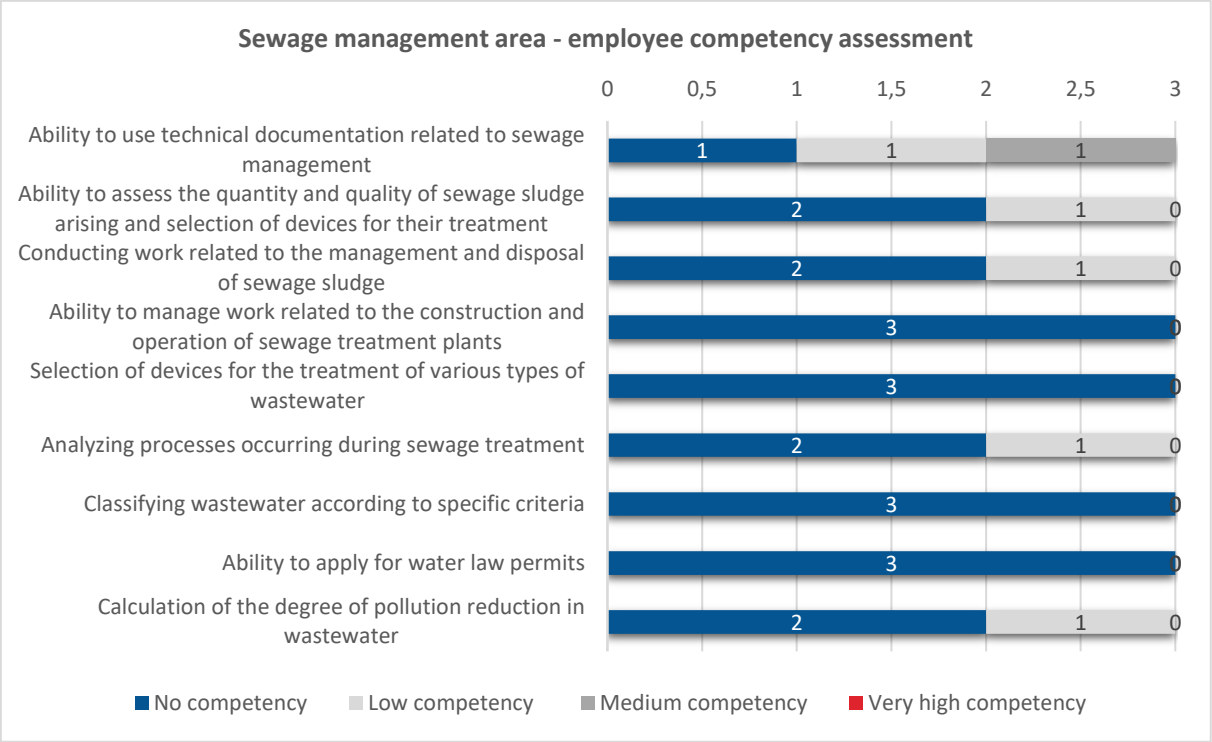
Figure 78: Level of relevance of competences in the field of wastewater management - Germany



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

In the case of the whole list of listed competences related to sewage management, entrepreneurs' responses indicated low or no competences of employees (Figure 79). All 3 companies were convinced of the lack of employees' competence in the area of Ability to manage works related to construction and operation of sewage treatment plants, Selection of facilities for treatment of various types of sewage, Classification of sewage according to specific criteria, Ability to apply for water permits.

Figure 79: Employees' level of competence in the field of wastewater management - Germany



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

In the area of wastewater management, there are no high level of competence gaps. The only competence deficits that appeared were related to the selection of wastewater treatment plants - a gap of -0.33 (Table 19).

Table 18: Specific competence gaps in sewage management - Germany

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Sewage management area	**0,22**	**0,26**	**0,04**
1	Ability to use technical documentation related to sewage management	0,67	1,00	0,33
2	Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment	0,33	0,33	0,00
3	Conducting work related to the management and disposal of sewage sludge	0,00	0,33	0,33

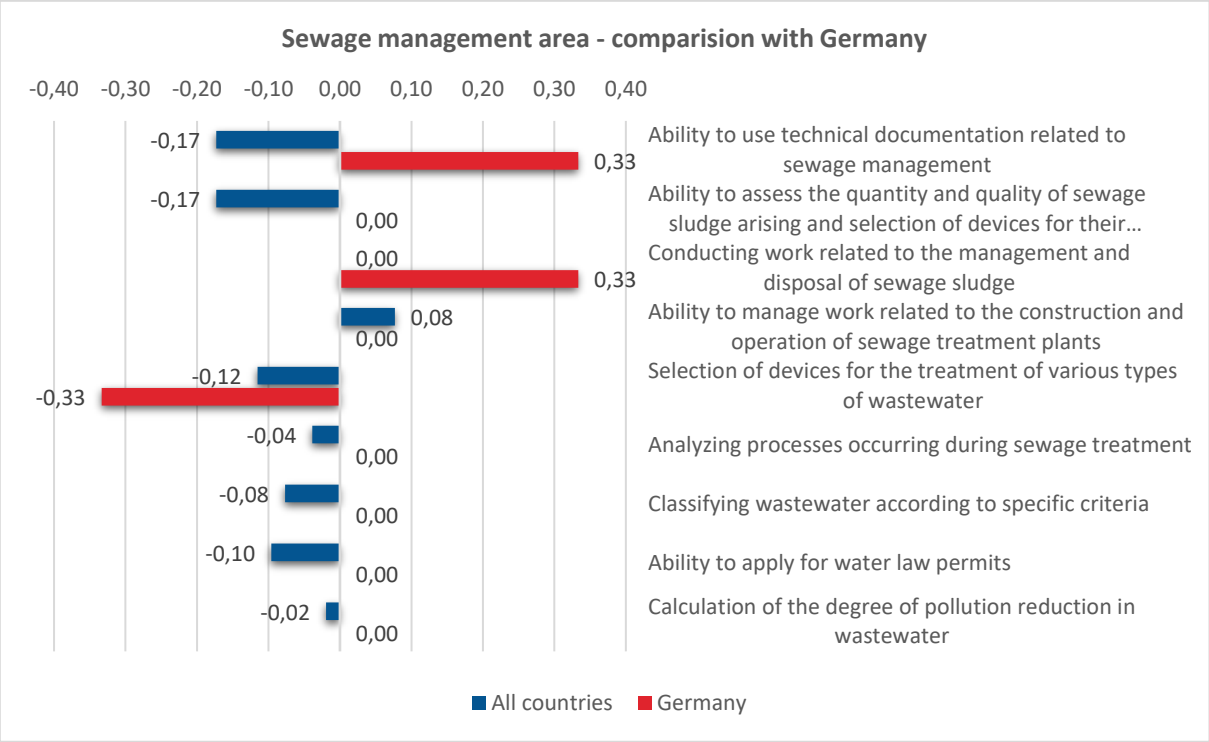
Co-funded by the Erasmus+ Programme of the European Union

4	Ability to manage work related to the construction and operation of sewage treatment plants	0,00	0,00	0,00
5	Selection of devices for the treatment of various types of wastewater	0,33	0,00	**-0,33**
6	Analyzing processes occurring during sewage treatment	0,33	0,33	0,00
7	Classifying wastewater according to specific criteria	0,00	0,00	0,00
8	Ability to apply for water law permits	0,00	0,00	0,00
9	Calculation of the degree of pollution reduction in wastewater	0,33	0,33	0,00

Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

German entrepreneurs indicated two competences, within which they particularly highly valued the skills of employees (competence gaps assumed a positive value - Figure 80). They are the ones who are most affected by the differences between Germany and the aggregate level of the gap from all countries. These are Ability to use technical documentation related to sewage management (competence gap at -0.17 - all countries, competence gap at -0.33 - Germany) and Execution of sewage sludge management and disposal works (competence gap at 0.00 - all countries, competence gap at -0.33 - Germany).

Figure 80: Specific competence gaps in sewage management - comparison with Germany



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

6.2. Experts' opinions on environmental management needs

The next stage of the study was qualitative interviews with experts in environmental management. In Germany, five experts were interviewed and asked questions about the costs of environmental management, environmental management training and environmental management competence needs.

6.2.1. Optimisation of environmental management costs in SME enterprises

The experts were asked for their opinion on **the amount of costs incurred in connection with the use of various aspects of the environment** and on the importance of cost optimization in the field of environmental management in enterprises of the MSME sector. All experts pointed to low costs incurred in water consumption and wastewater production. In most interviews, the respondents also indicated that the fees paid in connection with the use of electricity, waste and heating are average. Only one expert was of the opinion that *the costs incurred in connection with the use of electricity and heating are high* [3EG]. Optimisation of costs would therefore be justified in the context of those aspects for which the respondents to the study pointed to high or average costs.

The second question in the qualitative study concerned **aspects of the green economy (e.g. electricity, waste, water, wastewater, heating), which should be the focus when planning educational programmes for SMEs.** As the experts pointed out - all aspects of the green economy are important, however, in their opinion air protection and waste are the most important and should be focused on them when planning training programmes.

6.2.2. Assessing competence needs for environmental management

In the following part of the interview, experts were asked to assess the specific **competence needs related to environmental management in the SME sector.** They were to consider which competences of SME employees in the field of waste management are important for the functioning of MSME companies and which of them should be taken into account when planning educational programmes. According to the respondents, the training programme should include such elements as: *conducting works related to hazardous waste management* [4EG] *organizing waste collection and disposal, conducting works related to waste composting* [1EG], *selecting methods of waste disposal [2EG], selecting methods of waste management* [3EG], *selecting methods of industrial waste disposal* [5EG].

The experts also considered which **competences of employees in the field of air protection** are important for the functioning of companies from the MSME sector and worth taking into account when planning educational programmes. Among the proposals of the surveyed there were such aspects as *organizing activities related to the monitoring of atmospheric air pollution* [1EG], *recognizing the source of air pollution* [5EG], *choosing methods of air protection against pollution, choosing techniques and technologies, tools and materials for air purification depending on the properties of the removed pollutants and the conditions of the process* [3EG], *organizing and conducting works related to the removal of pollutants from the atmospheric air, recognizing techniques and technologies used in air protection* [2EG].

Another issue was the specific **competences of employees in the field of water management** and their importance for the functioning of companies from the micro and SME sector and planning of educational programmes. In this case, due to the indicated already high competences in this area, there were not many proposals. Among few examples, *the ability to choose a solution for rational water consumption* [4EG], *the ability to choose a solution for water protection against secondary contamination* [1EG], *and the ability to evaluate rainwater management systems* [2EG] were mentioned.

They were asked what **competences of employees in the field of wastewater management** are important for companies in the SME sector and planning educational programmes. Also in the case of competences related to wastewater management, experts pointed out the existing competences of employees and the low demand for training. Only one of the interviewees mentioned two skills that are important and, in his opinion, worth taking into account in the programmes: *the ability to use technical documentation related to wastewater management, analysis of processes occurring during wastewater treatment* [1EG].

The last issue raised during the expert interviews was **the competence of employees in the field of recycling, circular economy and environmental management** taking into account their importance from the point of view of the functioning of companies from the SME sector and the creation of educational programmes. The respondents indicated high importance of all skills related to the discussed area and unanimously mentioned

several competences, which due to their high importance and deficits of knowledge in this area should be included in training programmes. These were among them:

- using environmentally friendly economics in marketing and advertising,
- knowledge and skills to develop new markets and activities in the green economy,
- knowledge and skills in circular economy methods and technologies,
- environmental management knowledge and skills,
- knowledge and skills in preparing and reusing materials and consumables,
- knowledge and skills to develop corporate social responsibility in companies.

6.3. Examples of good practice in environmental management

The last stage of the conducted analyses was desk research, i.e. study of existing data, which consisted in the analysis of texts and materials available on the Internet describing examples of good practices in green education implemented in the country. Descriptions of examples of good practices implemented in Germany are presented below.

Waste Education Initiative (Waste EI)[33]

Erasmus + Waste Education Initiative (Waste EI) is a three year project which started in 2017, aiming to improve easte education across 5 regions of the EU. In order to exchange best practices, the proejct strives to encourage citizens to improve the quality and quantity of valuable resources in recycling. The regions covered by the partnership represent approximately a population of 7 million, producing 5 million tons of municipal waste (MSW) annually, employing various recycling methods. While the project is carried out by universities and businesses, it is aimed at changing behaviour patterns and maximizing recycling in the regions using cost-effective methods, through a combination of didactic and educational materials, and ICT. The ultimate goal of the project is creating a conscious and motivated generation of young Europeans who are prepared to utilise the opportunities offered by the “green” sector, stemming from decoupling economic growth and resource consumption within circular economy. Waste EI includes 5 partners from the higher education sector and 1 partner from the waste management/education industry, who formed a strategic alliance aimed at improving the knowledge provided to schools, higher education institutions, and the general population - citizens, by establishing a framework for circular economy education. The aim of the project is to create and provide educational materials, teaching aids, a website and resource network covering the structure of waste, waste prevention, sorting, reuse, recovery, and circular economy. The project is also developed to train school teachers in individual workshops so that any school waste across the EU is reused in terms of circular economy. It is also important to directly prepare young people to the opportunities offered by green economy, stemming from decoupling economic growth from resource consumption, which the essence of circular economy. Motivating the young generations across Europe is also essential, as they will be the driving force of the change.

[33] https://www2.mmu.ac.uk/environmental-science-research/waste-to-resource-innovation-network/activity/erasmusplus-waste-education-initiative/

Over the course of the project, the needs of waste management were evaluated as well as the basic data on waste was identified in each region. The analysis highlighted best practices and the possibility of sharing educational materials. The Waste Citizen Website "How do I?" was created to provide the population with a complete and detailed list of waste, providing information on how and where they can be recycled/reused/disposed of in each region. The manual and educational materials on waste management is developed based on the results of the waste management system assessment. The student and citizen manual will provide show what happens to waste after it is picked up for recycling and used in circular economy. The outcomes of the project will be disseminated via the website, workshops, publications and conferences. Partners: 1. Hamburg, Germany, The Hamburg University of Applied Sciences (HAW Hamburg) The HAW has an inter-faculty "Competence Centre of Renewable Energy and Energy Efficiency", an interdisciplinary unit bringing together experiences from different departments. Its extensive experience in technical research and implementation of curring edge projects in energy and sustainable climate development is contained in the Research and Transfer Centre, involving researchers, government agencies, and industry. 2. Greater Manchester, Great Britain, Manchester Metropolitan University (MMU), the project lead The project is led by the Waster 2 Resource Innovation Network, which is an cross-university organisation bringing together academic expertise and practical waste management experience across the Manchester Metropolitan area. Moreover, the Greater Manchester Combiner Authority (GMCA) is the waste disposal authority for the Greater Manchester area and provides the majority of waste and recycling education for school children and residents. 3. Bucharest, Romania, The University of Agronomic Sciences and Veterinary Medicine of Bucharest (UASVMB) is the oldest and largest university in the country. 4. Zagreb, Croatia The University of Zagreb is the oldest university in South-Eastern Europe. Its area of expertise include plant and animal biodiversity, soil and water pollution, new technologies in sustainable agriculture, new technologies in food production and waste management, to name but a few. 5. Tallinn, Estonia The Tallinn University of Technology (TTU) is an internationally renowned university with a vast experience in cooperation and research projects. Its Environmental Engineering Department (DEE) conducts research on the processes of determining surface water quality, communal and industrial waste treatment, and the impact of climate change on hydrological regimes.

LeKoKli[34] - municipality as the place for learning sustainable development

For over 35 years, the energy and environment centre in Deister e.V. has the centre of excellence in terms of sustainable construction and a recognised educator for sustainable development. The institution came up with the proposal of the LeKoKli project. The project intended to analyse and initiate active cooperation processes between schools, extramural education institutions, and local governments. The municipality is the "place to learn", where students of 1st and 2nd grade middle schools can present local, every day matters and participate in the development and revision of the town's concepts for climate protection and neighbourhoods. The project ran from January 2016 to June 2019 and covered the following stages:

- Analysis of the town's climate protection concepts and processes
- Use of focus groups/analysis of educational materials
- Conduction of actual labs

[34] https://www.umweltbildung.de/lekokli-projekt.html?&fontsize=458

- Climate protection workshops for teachers and managers
- Preparation of information material
- Dissemination of outcomes thorough regional meetings

The LeKoKli project made it possible to form an offer for municipalities, schools, and extramural education institutions in terms of [35]:

- Consultations, technical inspiration and training for schools, municipalities, and extramural training institutions on "municipalities involved in climate protection".
- Workshops on participatory integration of schools in municipal processes of climate protection for target groups of teachers and students, local educational actors, as well as employees if municipal and cross-municipal agencies.

Education for sustainable development in social youth work[36]

One of the objectives of the international action programme "Education for Sustainable development" (ESD) launched by UNESCO in 2015-2019 is providing educational opportunities for all. Prior to that, "young people" as a target group were not included in the activities covered by ESD. However, the youth should be seen as the priority group in terms of education for sustainable development. This also applies to all major areas of youth work, taking special care of young people who are disadvantaged socially or disabled. It is also necessary to apply action-oriented ESD measures, young people who are socially disadvantaged rarely have access to traditional education methods. At the same time, young people are valuable multipliers who are capable of transferring knowledge and attitudes among family members and friends in their local communities. In order to provide precise access to young people and convince them about the need to care for the environment, protect nature, and sustainable development, the Bavarian Ministry of Environment and Consumer Protection formed an agreement in 2010 on cooperation with the National Working Group on Youth Social Work. The intention was to create appropriate approaches and opportunities for targeted social group in terms of education for sustainable development. Under the agreement, the Bavarian Association of Youth Social Work successfully carried out a cooperation project on "Environmental Education/Education for sustainable development in youth social work in Bavaria", financed by StMUV in 2012-2016. The project's exceptional success is confirmed by the awards it received, including the 2015 Bavarian State Foundation and the 2016 award given by UNESCO within the DNB Global Action Programme. A new cooperation project, "Global Action Plan as an Opportunity: education for sustainable development meets youth social work" is aimed at utilising the earlier success. Practical and individual projects are financed all across Bavaria, which introduce the concepts of Education for Sustainable Development into youth social work. Emphasis is placed on the target group of "new immigrants". Particular projects are closely related to youth's living environment. This makes it possible to have topics and approaches as diverse as the participants: they can cultivate a garden together,

[35] LeKoKli - Lernfeld Kommune für Klimaschutz, https://www.e-u-z.de/projekt_lekokli.html, [access: 09.03.2020]
[36] Weltaktionsprogramm als Chance: Bildung für nachhaltige Entwicklung trifft Jugendsozialarbeit, https://www.umweltbildung.bayern.de/projekte/jsa/index.htm, [access: 11.03.2020]

repair bikes, explore nature as a diverse sphere of life, or become active experts in the field of energy. Completely different ideas are also welcome! The aim here is to transmit skills which enable informed decision making in terms of sustainable lifestyle. Experience-oriented approach and activation methods are valid methods of personal development and improvement of social competences. The basis is formed by design oriented skills in ESD, as well as principles of youth social work: participation, action-orientation, and significance of living environment. The projects are carried out in tandem with an environmental education partner. The target group consists of people who are socially disadvantaged or disabled, with increased support for 12-26 age group. Current data, information, and forms can be found at our website: http://ejsa-bayern.de/umweltprojekt.

BFKK competencies to work

WWW&CE

Water, Waste & Circular Economy

Norway

Norge

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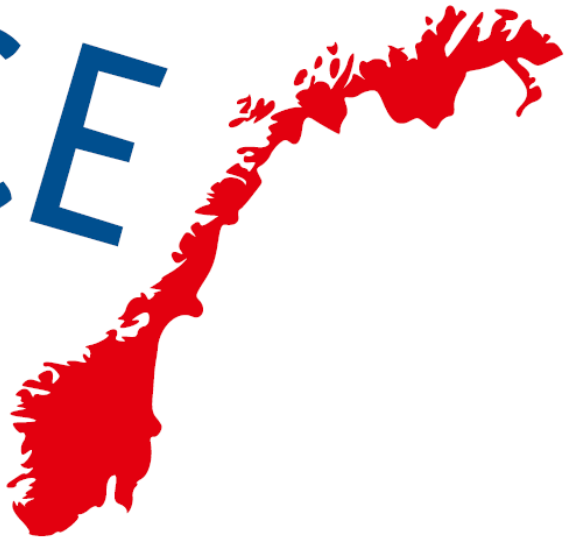
HANSE-PARLAMENT
Network for Small and Medium Enterprises

WWW&CE



Norway

Research in Norway was conducted by the Nordic Craft Forum. Two companies operating in Norway took part in the survey. One of them is a micro enterprise and another a medium-sized enterprise. The sectors covered by the survey are business services (including services for companies), real estate and service, social and individual activities. The chapter presents good Norwegian practices: Cooperation of companies with universities and colleges - examples from SESAM, BOB and Roaf; Strategic cooperation - SeSammen; Mesterutdanningen - Standard examination requirements for master craftsmen.

Norway

Norge

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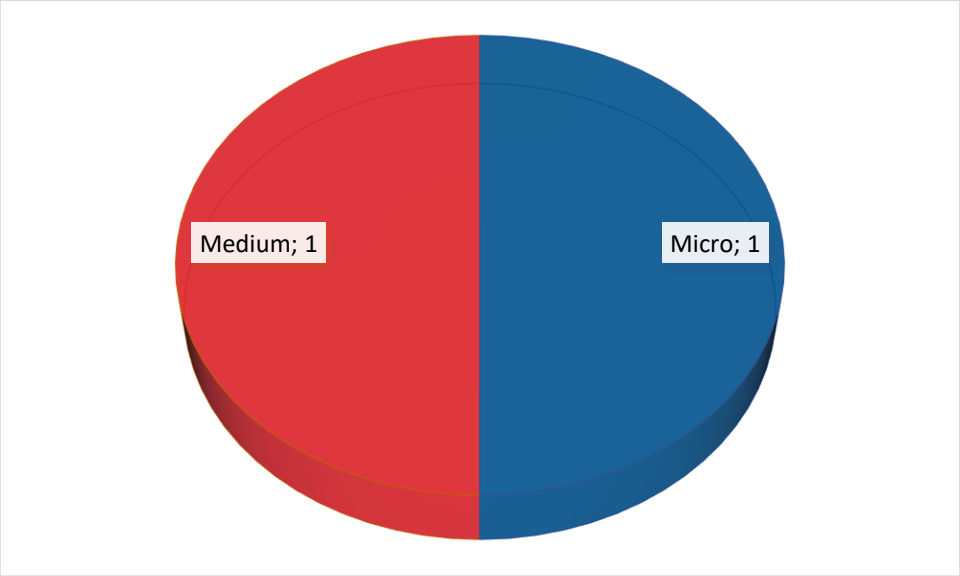
7. Norway

7.1. Results of quantitative studies on environmental management needs

The survey involved 2 companies operating in Norway. One of them is a micro enterprise and another a medium-sized enterprise (Figure 81).

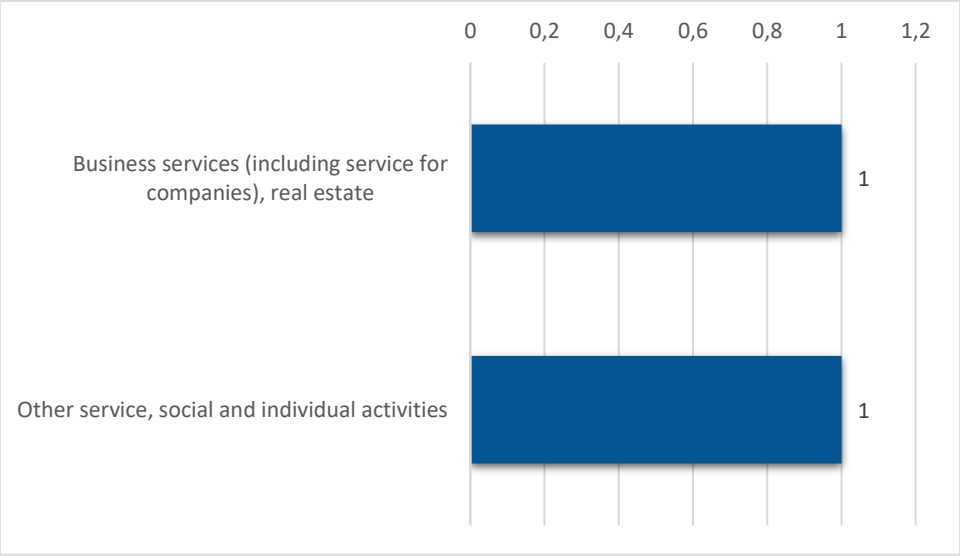
Figure 81: Company size - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

The industries to which the surveyed companies belong are business services (including corporate services), real estate and service, social and personal activities (Figure 82).

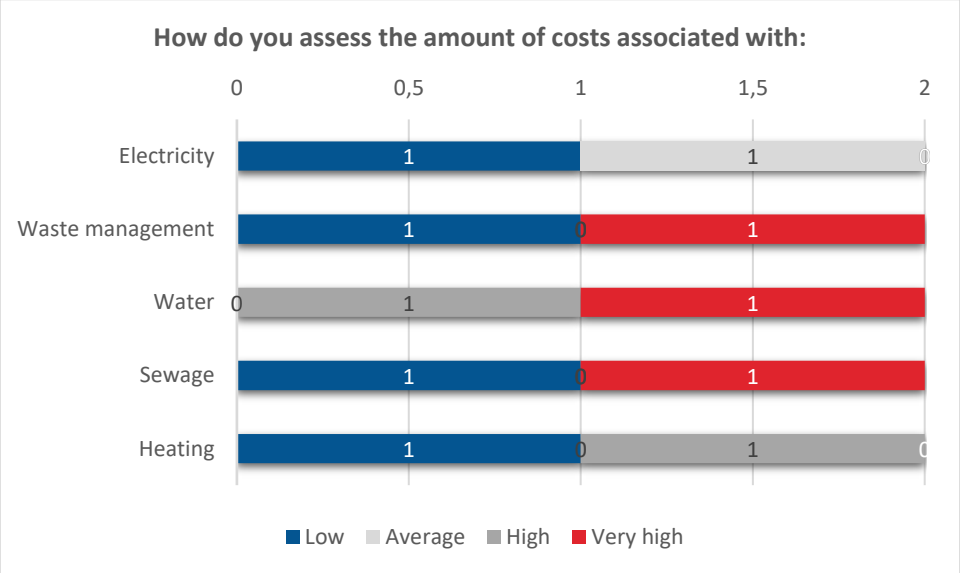
Figure 82: Main activity of the company - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

Entrepreneurs were asked to assess the amount of costs related to electricity, waste, water, sewage and heating in relation to the total cost of the company (Figure 83). The answers indicating high or very high costs concerned water (1 company - very high, 1 company - high), waste (1 company - very high) and sewage (1 company - very high).

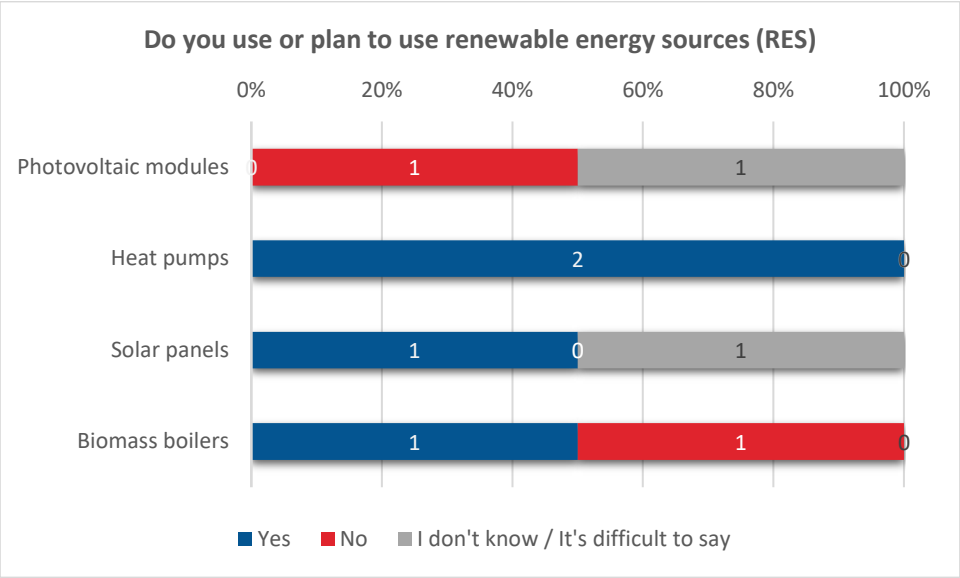
Figure 83: Costs incurred - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In response to the question about the use of renewable energy sources (RES) and their planned introduction in the future, both entrepreneurs showed interest in heat pumps. One affirmative answer was also provided for solar collectors and biomass boilers (Figure 84).

Figure 84: Use of renewable energy sources in companies - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

A filtering question was used in the research questionnaire in order to identify possible types of pollution produced by the surveyed companies, which subsequently allowed to identify areas requiring detailed analysis in terms of competence needs in environmental management. On this basis, companies that produce waste (both companies) and use water and produce sewage (both companies) were identified. None of the companies emits gases and dusts into the air (Figure 85).

Figure 85: Types of pollution generated by companies in their business activity - Norway

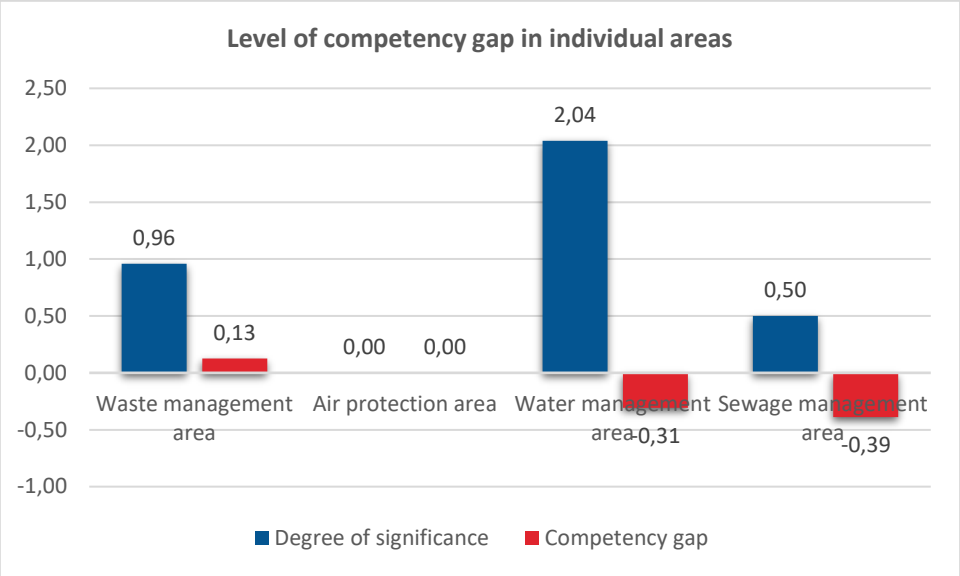
Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

Within the identified areas, the surveyed entrepreneurs were asked to assess the degree of significance of particular competences related to environmental economy from the point of view of the specificity of their company's operations, on a scale from 0 to 3 (where 0 means that a given competence does not concern their company, 1 - is not important, 2 - is important, 3 - is very important) and on a similar scale, to assess the current state of competences possessed by employees (where 0 means lack of competences, 1 - low competences, 2 - medium competences, 3 - very high competences).

The questions concerning competence needs in particular areas 1) waste, 2) emission of gases and dusts into the air, 3) water consumption and sewage production were answered only by those companies which declared that they use a given environmental aspect.

The competences in the area of water management, rated at 2.04 (Figure 86), were most important. Waste management (significance at 0.96) and sewage management (significance at 0.50) were close seconds, which is also associated with the largest competence gap. However, the competence gaps are not large, as entrepreneurs assessed them at the level of 0.39.

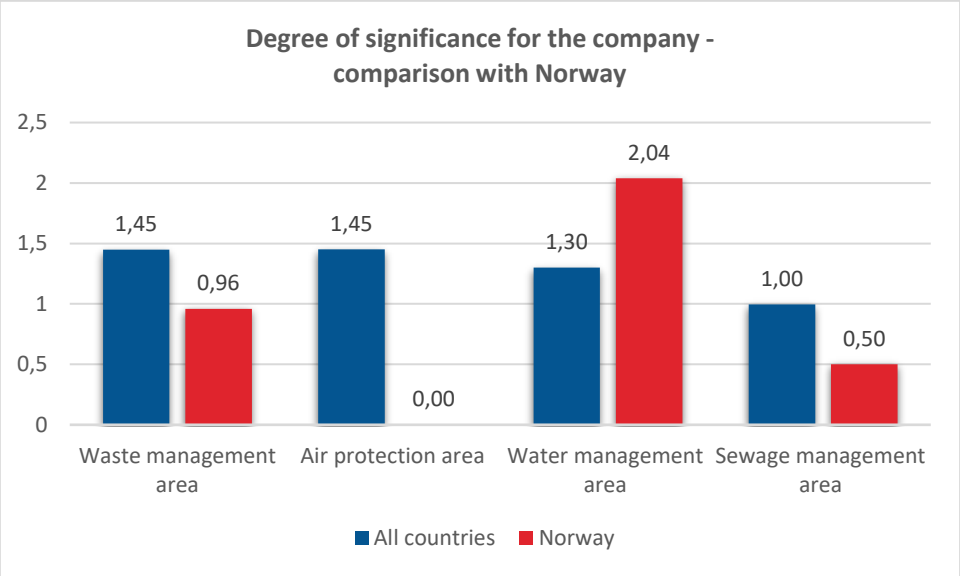
Figure 86: Level of competence gap in individual areas - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

Considerable differences in the assessment of significance of individual areas can be observed when comparing the summary results with the opinions of Norwegian entrepreneurs. A small number of enterprises representing Norway (2 companies) should be noted, which results in a small impact on the overall results. The biggest visible difference concerns the area of air protection, where the results for all countries indicate significance at the level of 1.45, while the responses of enterprises from Norway at the level of 0.00 (in this case, the companies did not comment on the area of air protection). There is also a large difference in water management - according to the companies surveyed in Norway, its average significance is 2.04, while the overall results indicate a level of 1.30 (Figure 87).

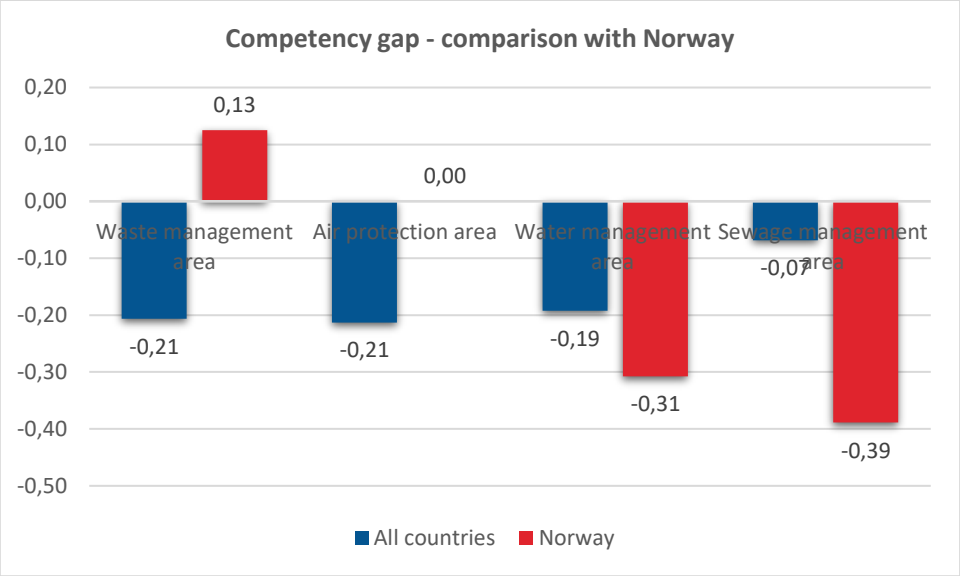
Figure 87: Level of relevance of competences - comparison with Norway



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

Among the competence gaps concerning Norway, one reached a positive level - in the area of waste management the gap level was 0.13, indicating that the competences of employees are higher than the expectations of employers (Figure 88). In the same area, cross-sectional results concerning all countries indicate a gap at the level of -0.21. High diversity also appears in the area of wastewater management (gap at the level of -0.07 - aggregate results, gap at the level of -0.39 - results from Norway).

Figure 88: Level of competence gap in individual areas - comparison with Norway

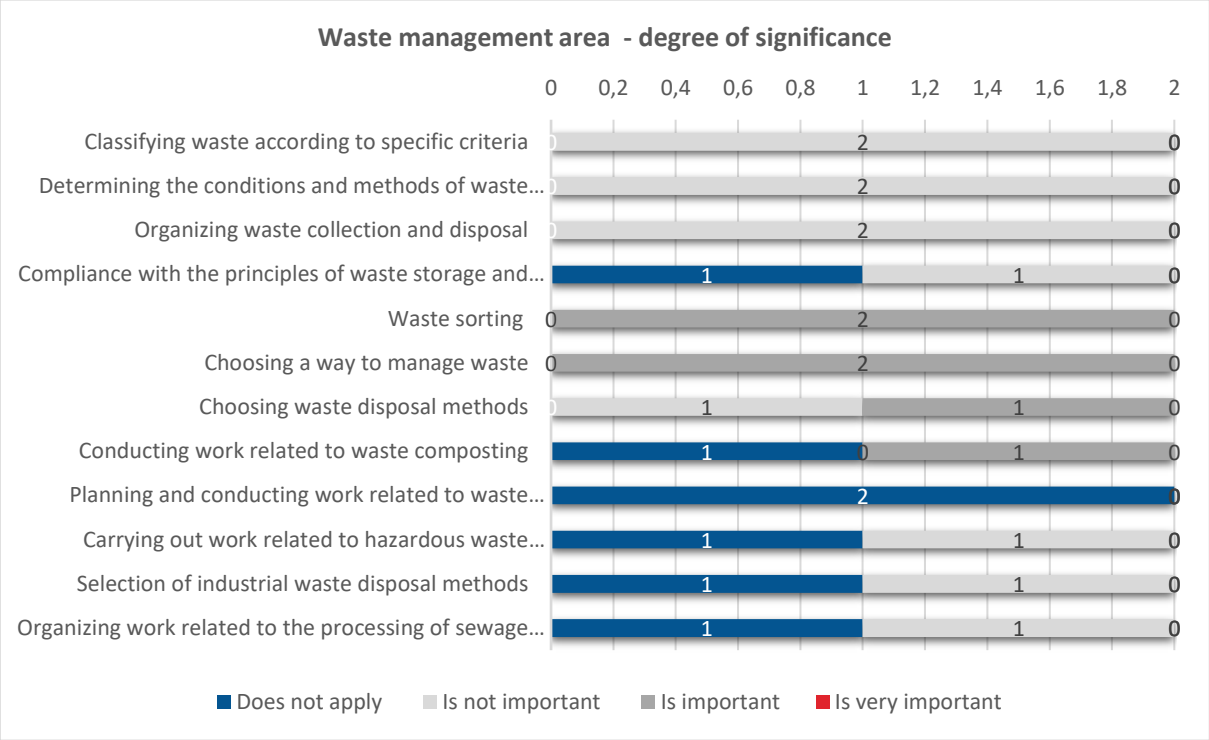


Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

7.1.1. Waste management area

In the area of waste management, both companies attributed the greatest importance to Waste Sorting and Selection of Waste Management (Figure 89). One answer each, indicating the significance of the skills, concerned Selection of waste disposal methods and Conducting waste composting works. The companies assigned the lowest significance to the Classification of waste according to specific criteria, Determination of conditions and methods of waste disposal and Organization of waste collection and disposal.

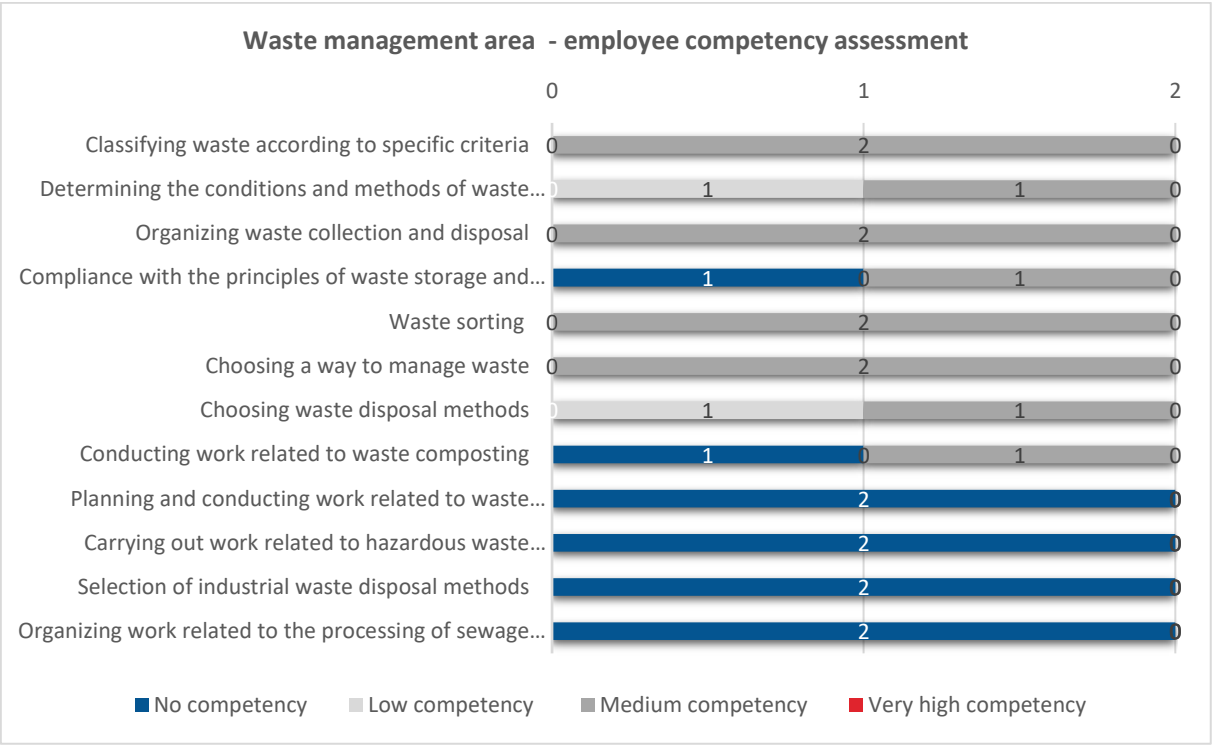
Figure 89: Level of relevance of waste management competences - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In the area of waste management, the level of competence of employees varies depending on individual skills (Figure 90). There are no high competences, while the average ones concern the Classification of waste according to specific criteria, Organizing waste collection and disposal, Sorting waste, Selecting the waste management method (both companies indicated that the level of competences within these skills is average). In the opinion of both companies, the lack of competence can be observed with respect to the performance of work related to the management of hazardous waste, Selection of methods for the disposal of industrial waste, Organization of work related to the processing of sewage sludge and operation of equipment.

Figure 90: Level of competence of employees in the field of waste management - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

Table 19 presents detailed data on the level of competence gaps in relation to waste management skills. As indicated by the data in the table, most of the gaps are positive, which means that the skills of employees are greater than the needs of employers in this respect. The only gaps, at the level of -0.50, were recorded in the performance of works related to the management of hazardous waste, Selection of methods of industrial waste disposal, Organization of works related to the processing of sewage sludge and operation of equipment.

Table 19: Specific competence gaps in waste management - Norway

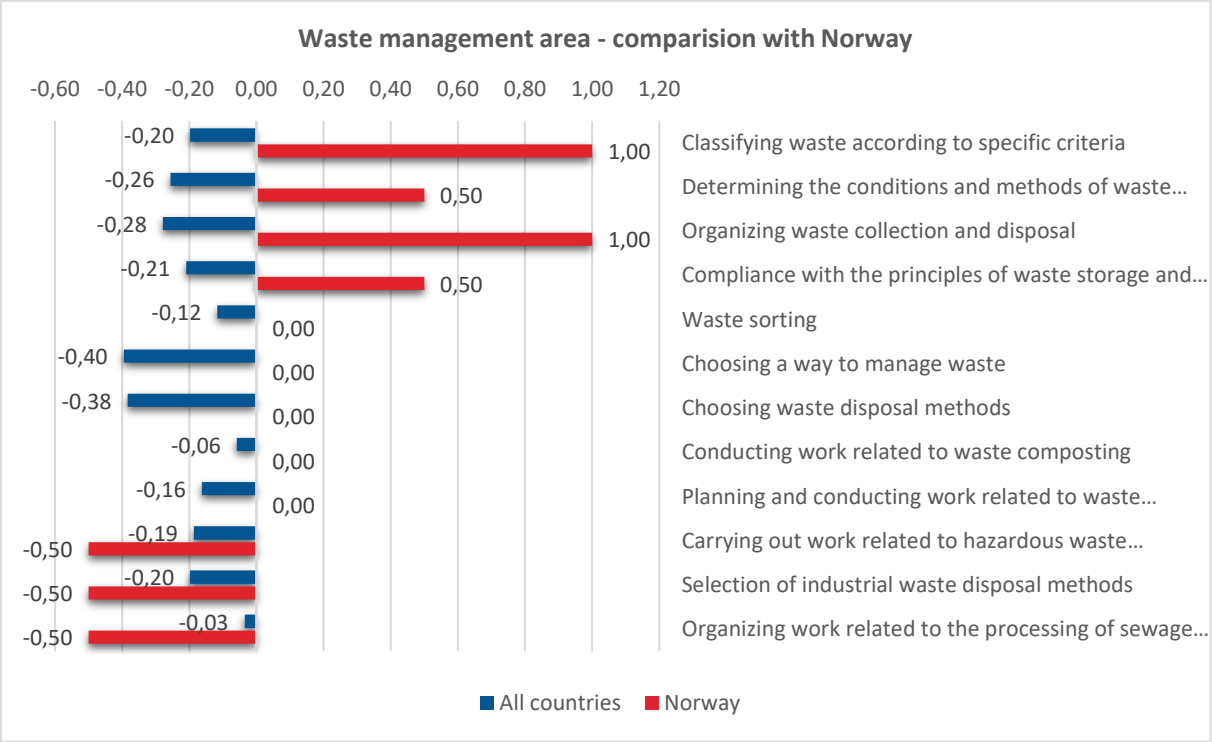
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Waste management area	**0,96**	**1,08**	**0,13**
1	Classifying waste according to specific criteria	1,00	2,00	1,00
2	Determining the conditions and methods of waste disposal	1,00	1,50	0,50
3	Organizing waste collection and disposal	1,00	2,00	1,00

4	Compliance with the principles of waste storage and storage	0,50	1,00	0,50
5	Waste sorting	2,00	2,00	0,00
6	Choosing a way to manage waste	2,00	2,00	0,00
7	Choosing waste disposal methods	1,50	1,50	0,00
8	Conducting work related to waste composting	1,00	1,00	0,00
9	Planning and conducting work related to waste incineration and operation of incineration plants	0,00	0,00	0,00
10	Carrying out work related to hazardous waste management	0,50	0,00	**-0,50**
11	Selection of industrial waste disposal methods	0,50	0,00	**-0,50**
12	Organizing work related to the processing of sewage sludge and the operation of equipment	0,50	0,00	**-0,50**

Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

The differences can be seen when comparing the overall results with Norway, where only two companies were surveyed (Figure 91). Among the most divergent levels of competence gaps appear: Classification of waste according to specific criteria (gap at -0.20 - all countries, gap at 1.00 - Norway) and Organisation of waste collection and disposal (gap at -0.28 - all countries, gap at 1.00 - Norway).

Figure 91: Specific competence gaps in waste management - comparison with Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

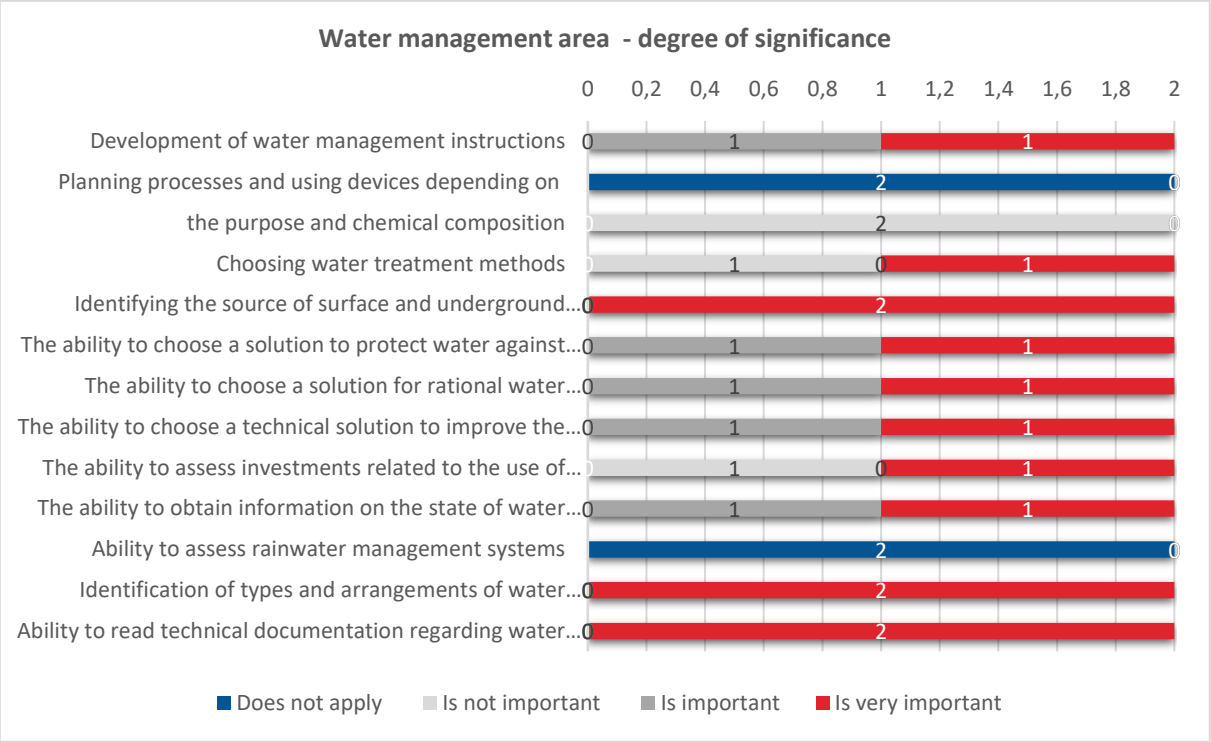
7.1.2. The air protection area

None of the Norwegian companies have indicated gas and dust emissions into the air in connection with their operations. Therefore, the companies were not able to address the competence issues related to the area of air protection, and the area was not analysed.

7.1.3. Water management area

In the most important area, which is water management, the companies assigned the greatest importance to the skills of choosing a solution to protect water from secondary contamination, the skills of reading technical documentation concerning water management, and the recognition of materials used in the construction of a water supply system - both companies replied that these competences are very important (Figure 92). Also highly rated were the Development of water management manuals, The ability to select a solution for rational water consumption, The ability to select a technical solution for improving the quality of captured water, The ability to evaluate investments related to the use of underground water resources, The ability to evaluate rainwater management systems (1 company replied that these skills are very important, 1 company replied that they are important).

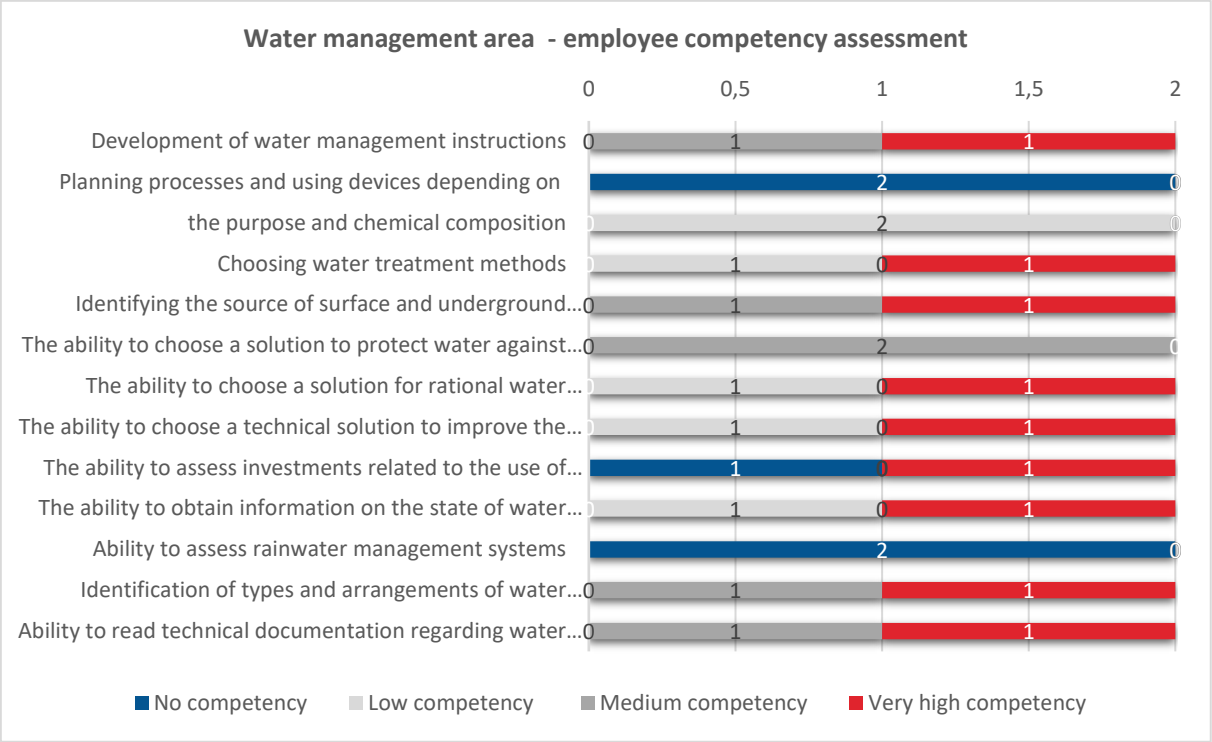
Figure 92: Level of relevance of competences in the field of water management - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

The lowest level of competence of the employees of the surveyed companies in the area of water management concerns Planning of processes and equipment depending on the purpose and chemical composition and Identification of types and systems of water supply networks in the area of the company - in the opinion of both companies the employees do not have knowledge in this area (Figure 93). Very high (1 company) or medium (1 company) competences were assigned to the following skills: Developing water management instructions, Ability to select a solution for water protection against secondary contamination, Ability to read technical documentation concerning water management, Recognizing materials used for building a water supply system.

Figure 93: Level of competence of employees in the field of water management - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

The results of the conducted research indicate that the biggest competence gaps (at the level of -0.50) in the area of water management concern: Skills of choosing a solution for water protection against secondary contamination, Skills of choosing a solution for rational water use, Skills of choosing a technical solution for improving the quality of water intake, Skills of evaluating investments related to the use of groundwater resources, Skills of obtaining information on the condition of water resources, available types of surface and groundwater, types of water intakes, Skills of reading technical documentation related to water management, Skills of recognizing materials used to build a water supply system, Skills of evaluating rainwater management systems. Detailed competence gaps in the area of water management are presented in Table 20.

Table 20: Specific competence gaps in water management - Norway

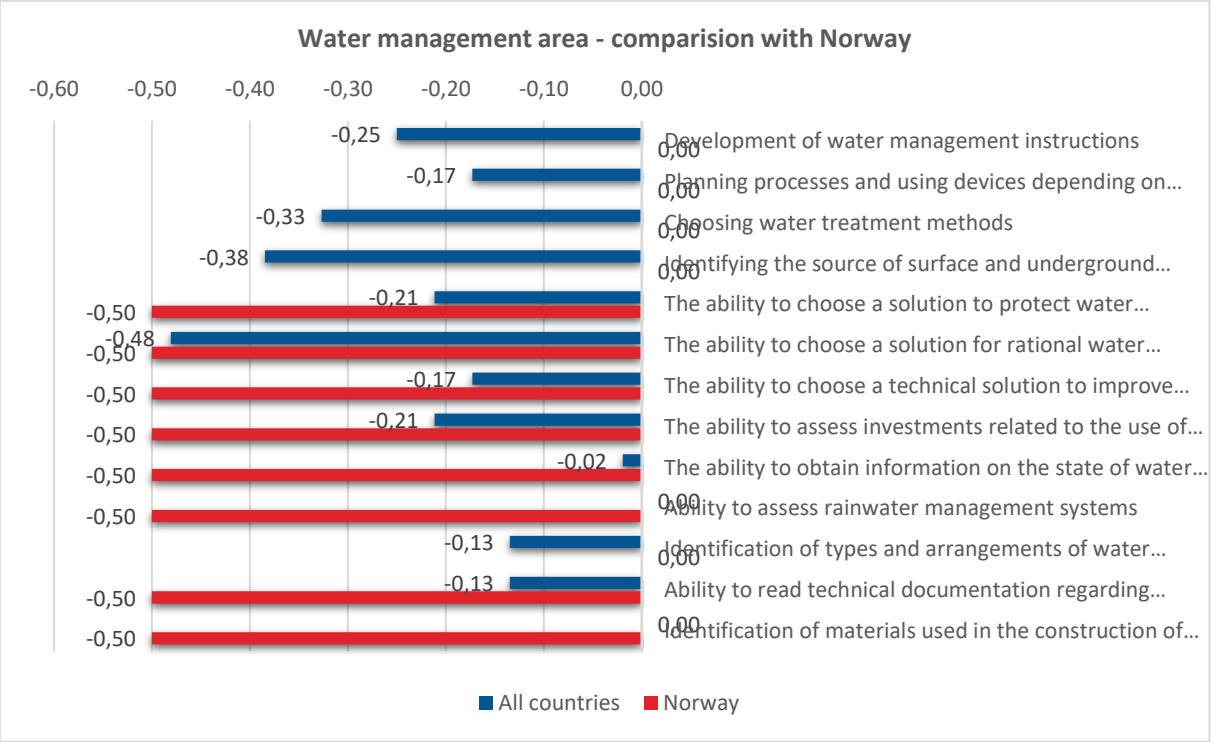
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Water management area	**2,04**	**1,73**	**-0,31**
1	Development of water management instructions	2,50	2,50	0,00

2	Planning processes and using devices depending on	0,00	0,00	0,00
3	the purpose and chemical composition	1,00	1,00	0,00
4	Choosing water treatment methods	2,00	2,00	0,00
5	Identifying the source of surface and underground water pollution	3,00	2,50	**-0,50**
6	The ability to choose a solution to protect water against secondary pollution	2,50	2,00	**-0,50**
7	The ability to choose a solution for rational water consumption	2,50	2,00	**-0,50**
8	The ability to choose a technical solution to improve the quality of captured water	2,50	2,00	**-0,50**
9	The ability to assess investments related to the use of groundwater resources	2,00	1,50	**-0,50**
10	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes	2,50	2,00	**-0,50**
11	Ability to assess rainwater management systems	0,00	0,00	0,00
12	Identification of types and arrangements of water supply networks on the company's premises	3,00	2,50	**-0,50**
13	Ability to read technical documentation regarding water management	3,00	2,50	**-0,50**

Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In the case of Norway, most of the competence gaps were at the level of -0.50 and turned out to be higher than the average value of deficits for all countries (Figure 94). The biggest differences concern Ability to obtain information about the state of water resources, available types of surface and groundwater, types of water intakes (competence gap at -0.02 - all countries, competence gap at -0.50 - Norway), Ability to assess rainwater management systems (competence gap at 0.00 - all countries, competence gap at -0,50 - Norway), Ability to read technical documentation on water management (competence gap at -0.13 - all countries, competence gap at -0.50 - Norway), Identification of materials used for building a water supply system (competence gap at 0.00 - all countries, competence gap at -0.50 - Norway).

Figure 94: Specific competence gaps in water management - comparison with Norway

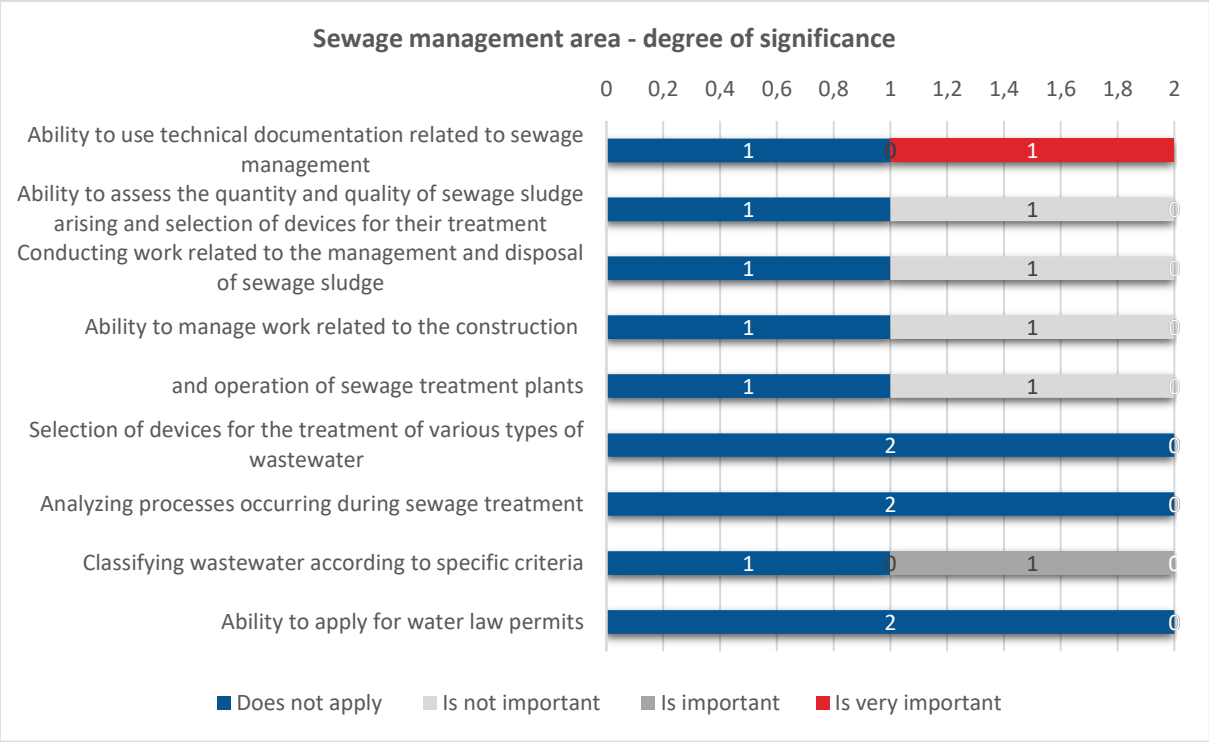


Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

7.1.4. Sewage management area

The majority of competences in the area of sewage management were considered by the surveyed entrepreneurs as not related to the operation of their company or not significant (Figure 95). One of the respondents considered the ability to use technical documentation related to sewage management as very important. The ability to apply for water-law permits is also important in the opinion of one company.

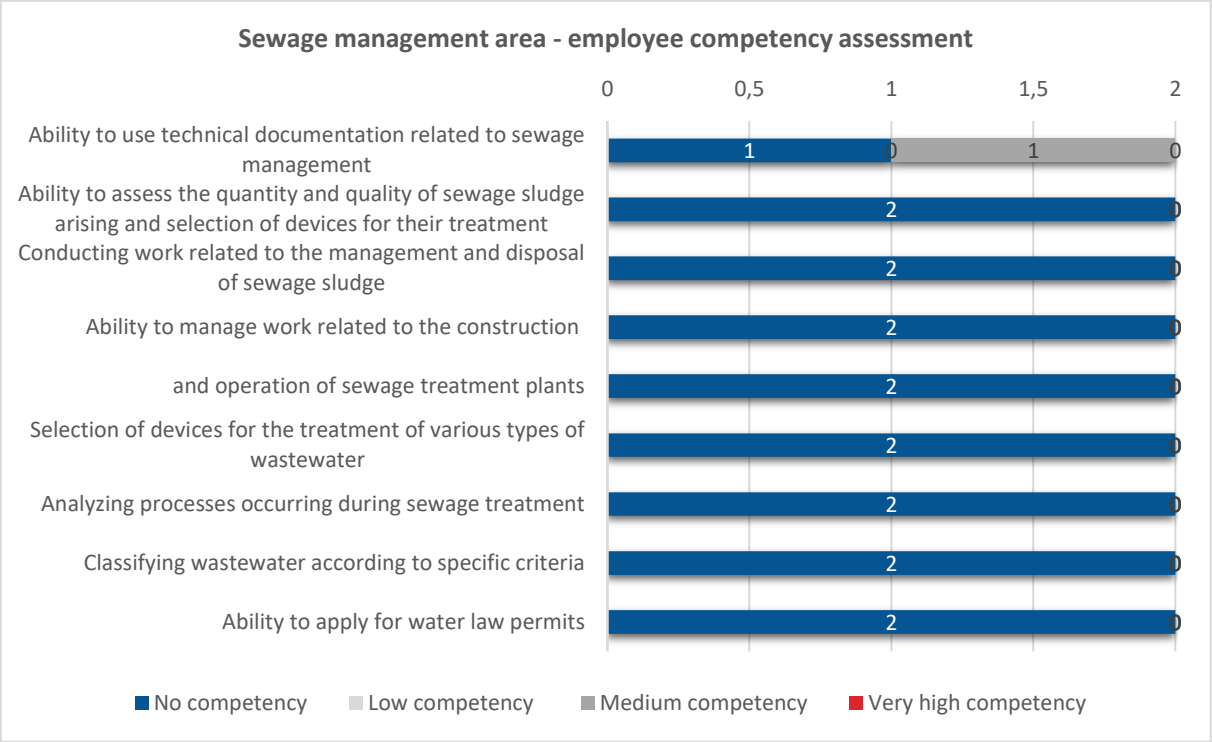
Figure 95: Level of relevance of competences in the field of wastewater management - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In the case of almost all the mentioned competences, the respondents indicated a lack of knowledge and skills of employees in this area (Figure 96). Only in the area of Ability to use technical documentation related to sewage management the competences of employees can be considered average in the opinion of one company.

Figure 96: Employees' level of competence in the field of wastewater management - Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In the area of wastewater management, the largest recorded gap, at -1.00, concerned the ability to apply for water permits. Gaps at -0.50 occurred within the following competences: Ability to use technical documentation related to sewage management, Ability to assess the quantity and quality of sewage sludge generated, selection of equipment for sewage sludge treatment, Conducting works related to sewage sludge management and disposal, Ability to manage works related to construction and operation of sewage treatment plants, Selection of equipment for treatment of various types of sewage (Table 21).

Table 21: Specific competence gaps in sewage management - Norway

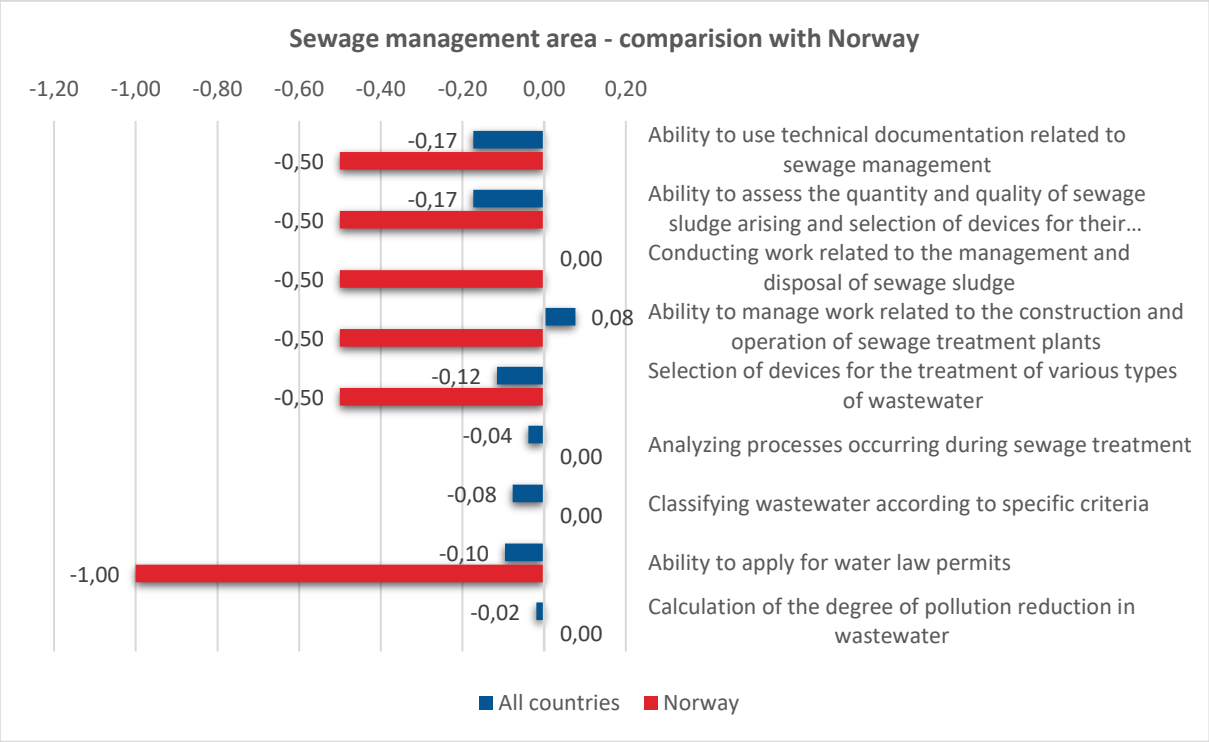
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Sewage management area	**0,50**	**0,11**	**-0,39**
1	Ability to use technical documentation related to sewage management	1,50	1,00	**-0,50**

2	Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment	0,50	0,00	**-0,50**
3	Conducting work related to the management and disposal of sewage sludge	0,50	0,00	**-0,50**
4	Ability to manage work related to the construction	0,50	0,00	**-0,50**
5	and operation of sewage treatment plants	0,50	0,00	**-0,50**
6	Selection of devices for the treatment of various types of wastewater	0,00	0,00	0,00
7	Analyzing processes occurring during sewage treatment	0,00	0,00	0,00
8	Classifying wastewater according to specific criteria	1,00	0,00	**-1,00**
9	Ability to apply for water law permits	0,00	0,00	0,00

Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In the opinion of Norwegian entrepreneurs the level of the competence gap is higher than the overall results for all countries (Figure 97). There are particular discrepancies with regard to the ability to manage the construction and operation of sewage treatment plants (competence gap at 0.08 - all countries, competence gap at -0.50 - Norway) and the ability to apply for water permits (competence gap at -0.10 - all countries, competence gap at -1.00 - Norway).

Figure 97: Specific competence gaps in sewage management - comparison with Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

7.2. Experts' opinions on environmental management needs

The next stage of the study was qualitative interviews with experts in environmental management. In Norway, four experts were interviewed and asked questions about cost optimization in the field of environmental management, training in environmental management, use of renewable energy sources and competence needs related to environmental management.

7.2.1. Optimisation of environmental management costs in SME enterprises

The experts were asked how important it is to **optimize costs in the field of environmental management in enterprises of the MSME sector.** According to the interviewees, *it is important to optimize the costs of environmental management in order to minimize costs and use existing resources as effectively as possible* [4EN]. In the opinion of the respondents, a lot of emphasis should be put on the issues concerning surface water: *we must perceive rainwater as a resource and use it for washing cars, toilets and other things that do not require the quality of drinking water. Furthermore, we have to look at our external areas. They should be shaped as overflow bowls, so that our outdoor areas can retain rainwater in heavy rainfall* [1EN]. Another expert was of a similar opinion, who stated *that rainwater is a resource and is used for many purposes where drinking water quality is not necessary. Purposes such as street cleaning, car washing, flushing toilets and watering*

vegetation, purposes that can be short-term and reduce the load on already overloaded water infrastructure. Landscaping must ensure water infiltration in order to maintain groundwater levels. Water is retained by temporarily placing areas under water in a controlled manner and larger quantities are safely passed through external areas. Proper handling of marine waters will be an important contribution to more sustainable water use. Domestic water can be used for many purposes. Local use will be important in saving resources of expensive infrastructure [2EN].

Other issues, important according to the interviewees, are food waste and the use of renewable energy - *we must also see food waste as a resource, not a waste. Composting food becomes an opportunity, not leaving it to rot. Composted food provides good soil for growth and opportunities for growing new food. In addition, the use of renewable energy in the form of solar cells and more is a topic on which we should now focus more, due to the emphasis on zero emissions. This includes the reuse of rainwater, solar energy, food, building waste* [1EN].

The second question in the qualitative study concerned aspects of the green economy (e.g. electricity, waste, water, sewage, heating), which should be the focus when planning educational programmes for SMEs. In addition to the issues highlighted by the interviewees earlier, they stated that *the focus should be on providing those planning educational programmes with knowledge so that they know what resources are currently being used (electricity, waste, water, sewage and heating), so that they are aware of the possibilities of reusing the*m [4EN]. An important issue is, according to one expert, *reduced environmental management to minimise the costs of using existing resources* [3EN].

7.2.2. Renewable energy sources

Another area raised was **the importance of using renewable energy sources (RES)** in the SME sector. *Renewable energy is, of course, something to learn if we have built solar cells today that provide the power to charge machines and equipment. In order to use renewable energy, you also need to see how the energy is consumed throughout the day* [1EN] - said one of the experts.

Attention was also drawn to the use of renewable resources related to soil quality: *composted food waste, garden waste will be an important resource in the future. Norwegian soil production has not used renewable resources such as peat and sand from sediment for many years. It is important to know about the use of renewable energy. Experience with systems and procedures should be shared. Examples: Renewable energy must be distributed through 24-hour temporary storage of energy, loaded in the available time. The reuse of resources is important for the development of a circular economy* [2EN].

Questions were also examined whether and if so, to what extent **training in renewable energy sources (RES)** for SMEs should be promoted (e.g. solar modules, heat pumps, solar collectors, biomass boilers). Among the proposed topics there is *the learning of how to use an energy bank as a memory carrier - it often tends to draw electricity from the grid when it is available at night and then use batteries during the day when energy is more expensive* [1EN]. According to experts, it is also worth noting such aspects as: *the knowledge of reasonable technical solutions, the introduction of a wider range of solar power plants* [3EN], *the knowledge of high environmental importance and the reason for using the existing resources, the possibility of preparing financial accounts for investment and operating costs* [4EN].

7.2.3. Assessing competence needs for environmental management

In the following part of the interview, experts were asked to assess **the specific competence needs related to environmental management in the MSME sector**. They were supposed to consider which competences of SME employees in the field of **waste management** are important for the functioning of SME companies and which of them should be taken into account when planning educational programmes. The first issue important from the point of view of the respondents was the assessment of different types of waste - *the ability to compost food and green waste and knowledge of relevant regulations. In addition, it is important to evaluate the dismantling method, evaluate and find areas for reuse, the ability to use recycled materials* [1EN]. *Knowledge must include the evaluation of different types of waste and choose alternative treatment and use. You must be able to compost food waste, organic waste from gardens and parks. Be able to choose alternative waste applications and know the limitations of the regulations* [2EN]. Other elements worth considering are *the ability to introduce new and efficient waste management systems* [3EN].

According to one expert, the current state of waste management in Norway is satisfactory, so the need for training is not great: *Norwegian waste management practice seems to work well. There is a sorting by source on most construction sites, where hazardous waste is also classified. Waste is deposited in municipal landfills* [4EN].

The experts also considered which **competences of employees in the field of air protection** are important for the functioning of companies from the MSME sector and worth taking into account when planning educational programmes. The elements mentioned by the interviewees were: *the ability to plan and commission a construction site with zero emission machines and equipment, the ability to calculate the energy needed to build a construction site with zero emission* [1EN], *and the improvement of qualifications to use heavy machinery* [3EN]. One of the experts also referred to training for workers who use chemicals, harmful substances and gases at work, *in which case the training programme must include: ability to use substances without causing harm, knowledge of the protective equipment used, consequences and risks for the environment (air, forest, water, etc.). In addition, the training must provide knowledge of alternative substances that are less harmful* [4EN].

Another issue was the specific **competences of employees in the field of water management** and their importance for the functioning of companies from the SME sector and planning of educational programmes. One of the experts' proposals concerning aspects worth taking into account in the training programmes were: *the ability to plan the installation for rainwater reuse, calculate the amount of available rainwater, use rainwater, identify the degree of water pollution and find countermeasures, use solar energy to put the used water into circulation* [1EN]. Other proposals for educational programs were: *filtration and water handling* [3EN].

One expert also drew attention to the need for training for those involved in design and construction: *training for those planning and designing installations. The education programme must also involve other actors, architects and others involved in building planning and design, so that, for example, the necessary space for additional water abstraction is provided where appropriate. Plumbers must have the knowledge to install according to the designed drawings. Where a company has to improve or rebuild existing water management installations, the company must provide the relevant plumbers - often a professional manager within the*

company - with the knowledge necessary to assess the adaptability. The final decision and planning for each conversion is made in cooperation with the project planner [4EN].

They were asked what **competences of employees in the field of wastewater management** are important for companies in the SME sector and planning educational programmes. According to the experts, the following aspects are important and worth taking into account in the programmes: *ability to assess the degree of pollution, ability to select cleaning agents, use of grey water as a fertiliser* [1EN], *ability to apply and reduce wastewater and grey water, ability to treat and reuse grey water* [2EN].

The last issue raised during the expert interviews was **the competence of employees in the field of recycling, circular economy and environmental management** taking into account their importance from the point of view of the functioning of companies from the SME sector and the creation of educational programmes. According to the first expert, *the ability to reuse materials from one's own construction site or others, the ability to estimate/value the costs of reuse of materials is important. Having knowledge about the acquisition of secondary raw materials and collection of recycled materials, materials suitable for processing. Ability to build with re-use methods, ability to plan in the life cycle* [1EN]. Another study responded to the issue of materials disassembly: *it is necessary to be able to consider the disassembly of building materials on site and prepare suitable materials for recycling. Think about the benefits of material recycling, find out where the right materials for recycling are, know how to process and install them. Be able to plan and build to make reuse possible* [2EN].

In the replies of the interviewees, the issue of the use of renewable energy also arose: *the use of renewable energy in the form of solar cells, and this is not only one of the topics on which we should focus due to the emphasis on zero emissions. Above all, we must take advantage of the natural opportunities we have and reuse rainwater, solar energy, wasted food, building waste. In conclusion, the common denominator is a circular economy* [1EN].

7.3. Examples of good practice in environmental management

The last stage of the conducted analyses was desk research, i.e. study of existing data, which consisted in the analysis of texts and materials available on the Internet describing examples of good practices in green education implemented in the country. Descriptions of examples of good practices implemented in Norway are presented below.

Cooperation between business and universities/higher education - examples of SESAM, BOB and Roaf [37]

Several companies dealing in waste management established cooperation with the university and higher education sector to strengthen targeted research and educational opportunities for the sector. The cooperation works for both sides to increase specialised knowledge in the waste sector, and to raise awareness at the regional and local level. Cooperation contributes to expanding knowledge about the opportunities created by circular economy. Businesses operating in waste treatment conduct recycling classes for school children and

[37] FOU-PROSJEKT NR. 174032 HAR VI AVFALL I 2030?, https://no.ramboll.com/-/media/files/rm/rmno/sirkular-okonomi-sluttrapport.pdf?la=no, [access: 10.03.2020]

university students. Residents gain knowledge about handling waste. Activities aimed at disseminating knowledge contribute to increased awareness among children, also in terms of the rationale behind sorting waste, but also on actual amounts of waste produced by Norwegian households. This may form the basis for shaping attitudes in the future, as research indicates that such attitudes are formed at an early age. Children's attitudes in the long term may affect their parents' behaviour. Such information measures and dissemination of knowledge among citizens is necessary for successful waste separation. Many companies in the waste treatment business find this to be an important component of their social mission and see it as a good opportunity to share their knowledge with citizens and receive valuable feedback. This example illustrates the key role of municipalities in spreading awareness about circular economy.

Strategic cooperation – SeSammen[38]

Several municipalities and inter-municipal companies in Norway acknowledge the opportinities of cooperating between regions. One example is the cooperation between seven waste management companies and the SeSammen municipality in central Norway. Cooperating companies include Envina, Innherred Renovation, Midtre Namdal Waste Company, Fjellregionen Interkommunale, Fosen Renovation, Hamos Administration, and Steinkjer Municipality. The vision behind the cooperation is about the "will to work as a single socially responsible entity using resources in accordance with the cycle of waste. Cooperation takes into consideration reusing and recycling of waste and corporate social responsibility." Apart from establishing the Ecopro biological waste disposal plant, the cooperation enabled the creation of concrete tools in the form of employee surveys, shared questionnaires on customer satisfaction, and a separate textile campaign focused on increasing the use of recycled resources. This includes cooperation with several waste management companies, private businesses and volunteers. The key of this form of cooperation is the transition to circular economy. This strategic collaboration of municipalities and companies enables increased economies of scale in significant areas such as higher capital investments and harmonised waster sorting systems. It also provides the opportunity to develop competences in the sector and establish strategic attitudes at the regional level. At the same time, the cooperation satisfies the need for adjusting measures to local conditions. Also, such cooperation shows the significant potential of communal waste management, but also indicates the importance of increasing the competences of a wide range of stakeholders.

Mesterutdanningen - standard requirements in master craftsman examination

Norwegian standard requirements for master craftsmen examination tests also refer to pro-environmental end innovative measures. Environmental matters - recognition and care of the natural environment and human surroundings are inscribed in the set of general competences (*Generell kompetanse*) in requirements standards. At first sight it may seem that other countires have tackled the issue similarly. For example, corresponding starndards in Poland also include knowledge about environmental protection measures. However, in the case of Norway, significant emphasis is placed on awareness and ecological aspects (including human impact) in the

[38] https://no.ramboll.com/-/media/files/rm/rmno/sirkular-okonomi-sluttrapport.pdf?la=no

course of business and professional activity. It does not focus on rules and provisions, like in Poland. Issues related to the natural environment are defined as a knowledge resource (*Kunnskap*) to learn from and forms part of the information about the work environment (*arbeids miljø).* It is worth noting that the scope of a master craftsman's competences included in the standard also cover the responsibility for systematic and continuous training of staff in these matters. In many other countries, including Poland, the competences of master craftsmen only apply to their own continuous education, meaning that there is no reference to the formation of the competences of their subordinates.

BFKK competencies to work

WWW&CE

Water, Waste & Circular Economy

Poland

Polska

Co-funded by the Erasmus+ Programme of the European Union

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Poland

The research in Poland was conducted by the Białystok Foundation for Human Resources Education. 28 companies operating in Poland took part in the survey. The largest number of them, 13 of which were small enterprises, 11 were classified as micro-enterprises and the remaining 4 were medium-sized enterprises. Among the companies analyzed there were 8 operating in the service industry, social and individual activities, companies from the hotel and restaurant industry (6 companies), trade and repairs (5 companies), industry (4 companies), company service, real estate (3 companies) and transport, warehouse management and communications. This chapter presents Polish good practices in the development of green competencies: ecoProfession - a strategic partnership for adapting vocational education systems to the challenges of the green economy; "Energize to Learb". PGNiG TERMIKA educational programme; Study of Closed Circuit Economy (Silesian University of Technology).

Poland

Polska

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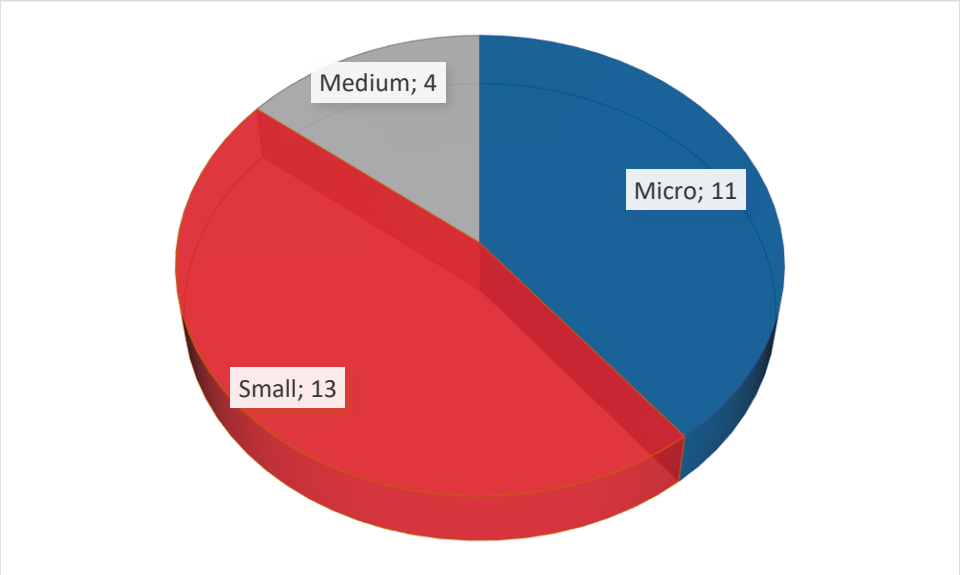
8. Poland

8.1. Results of quantitative studies on environmental management needs

The survey involved 28 companies operating in Poland. The largest number of them, 13 of which were small enterprises, 11 were classified as micro-enterprises and the remaining 4 were medium-sized enterprises (Figure 98).

Figure 98: Company size - Poland



Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

Among the companies analyzed there were 8 companies operating in the sector related to services, social and individual activities (Figure 99). The survey also included companies from the hotel and restaurant industry (6 companies), trade and repairs (5 companies), industry (4 companies), business services (including services for companies), real estate (3 companies) and transport, warehouse management and communications (2 companies).

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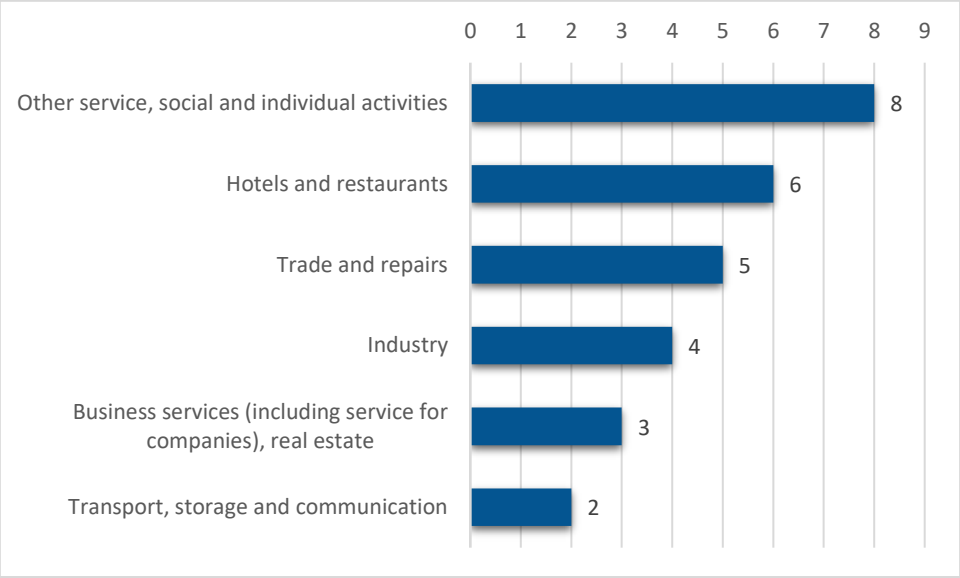
Network for Small and Medium Enterprises

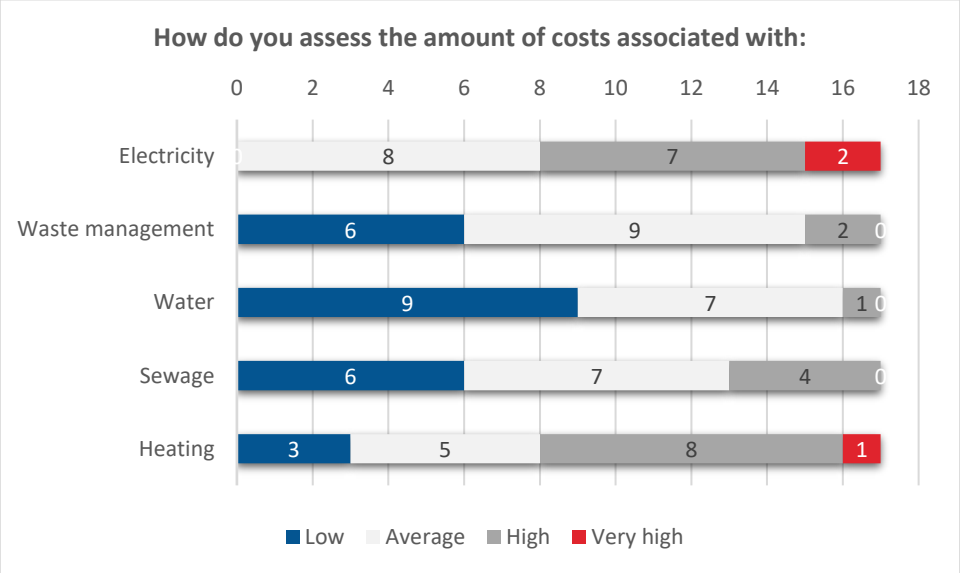
Figure 99: Main activity of the company - Poland



Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

Entrepreneurs were asked to assess the amount of costs related to electricity, waste, water, sewage and heating in relation to the total cost of operation of the company (Figure 100). According to the respondents, the highest costs are incurred in connection with electricity consumption (2 answers - very high, 7 answers - high) and heating (1 answer - very high, 8 answers - high). The smallest with water (9 answers indicated low costs, 7 - medium, 1 - high).

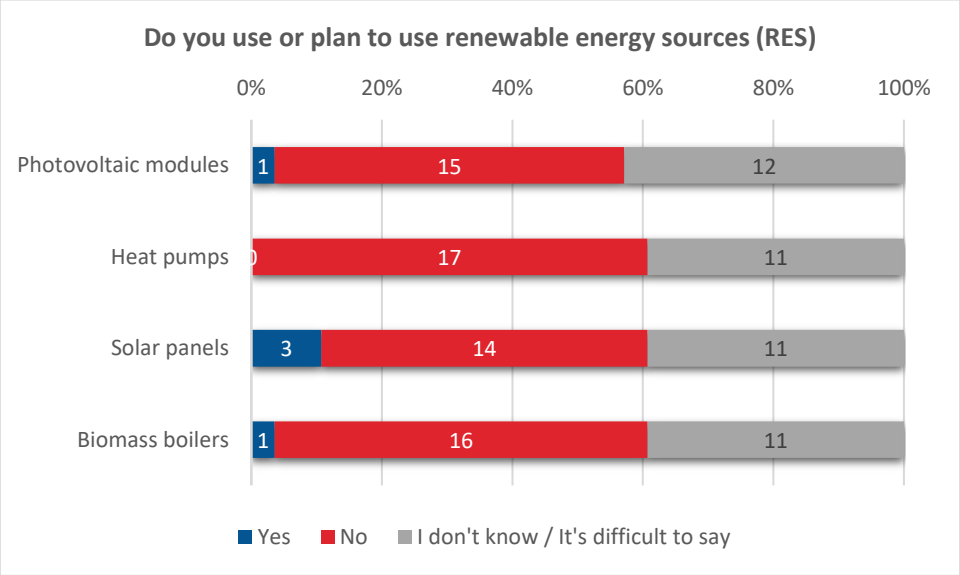
Figure 100: Costs incurred - Poland



Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

In response to the question about the use of renewable energy sources (RES) and their planned introduction in the future, the majority of entrepreneurs stated that RES are not and will not be used or were unable to answer the question (Figure 101). 3 affirmative answers concerned solar collectors and one photovoltaic module each and biomass boilers.

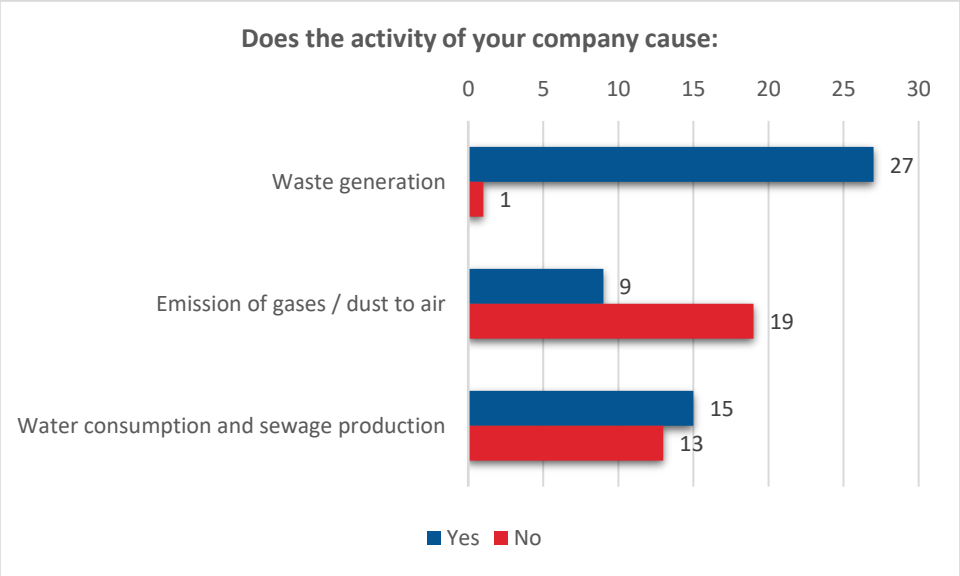
Figure 101: Use of renewable energy sources in companies – Poland



Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

A filtering question was used in the research questionnaire in order to identify possible types of pollution produced by the surveyed companies, which subsequently allowed to identify areas requiring detailed analysis in terms of competence needs in environmental management. On this basis, companies that produce waste (27 companies), emit gases and dust into the air (9 companies), and use water and produce sewage (15 companies) were identified - Figure 102.

Figure 102: Types of pollution generated by companies in their business activity - Poland



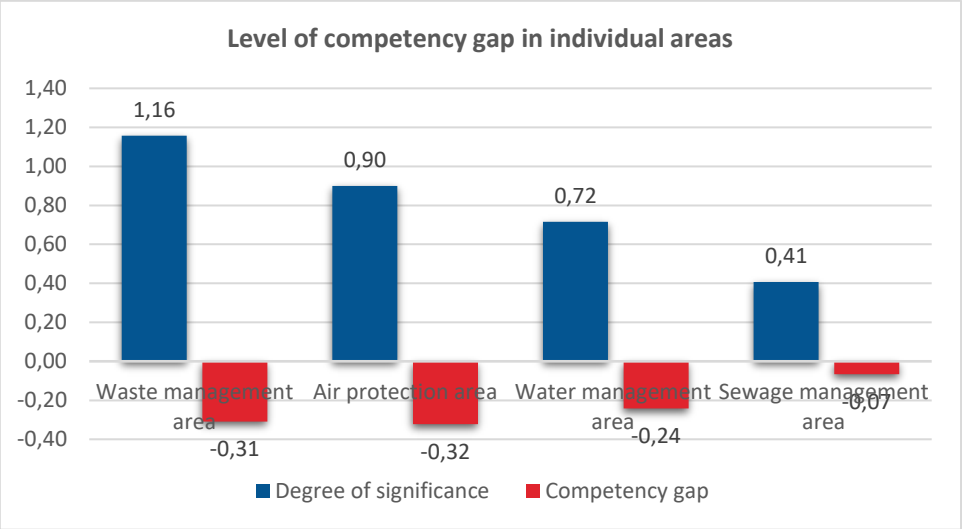
Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

Within the identified areas, the surveyed entrepreneurs were asked to assess the degree of significance of particular competences related to environmental economy from the point of view of the specificity of their company's operations, on a scale from 0 to 3 (where 0 means that a given competence does not concern their company, 1 - is not important, 2 - is important, 3 - is very important) and on a similar scale, to assess the current state of competences possessed by employees (where 0 means lack of competences, 1 - low competences, 2 - medium competences, 3 - very high competences).

The questions concerning competence needs in particular areas 1) waste, 2) emission of gases and dusts into the air, 3) water consumption and sewage production were answered only by those companies which declared that they use a given environmental aspect.

The competences in the area of waste management, rated at 1.16, were the most significant. The area of air protection - significance at 0.90 - was slightly lower. These two areas are also affected by the most significant competence deficits of employees - at -0.32 in the area of air protection and -0.31 in the area of waste management (Figure 103).

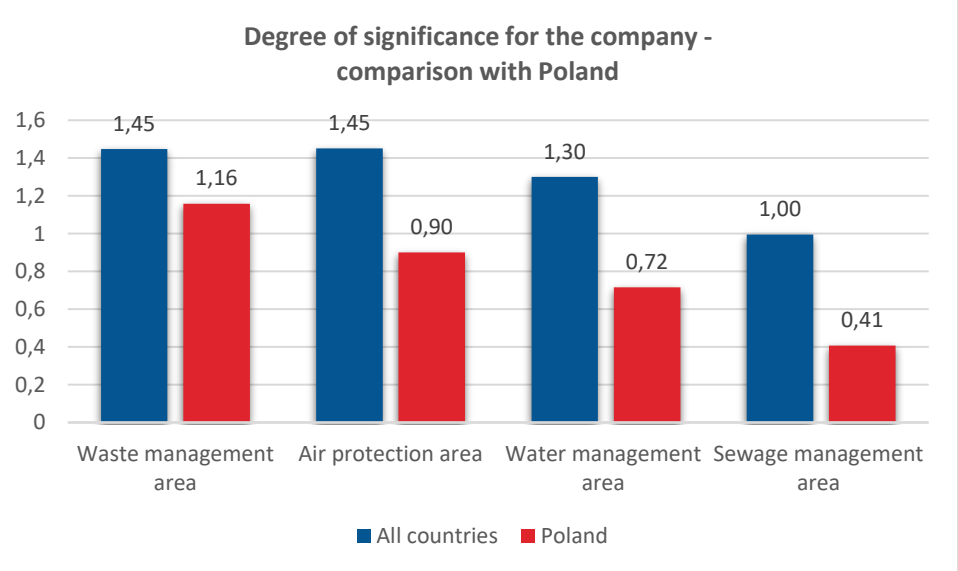
Figure 103: Level of competence gap in individual areas - Poland



Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

The greatest inconsistency between the aggregate results and the data on Polish entrepreneurs occurs in the area of waste management, where the overall results for countries indicated significance at 1.00 and the results from Poland at 0.41 (Figure 104). A slightly smaller difference concerns the area of water management (significance at 1.30 - all countries, significance at 0.72 - Poland) and air protection (significance at 1.45 - all countries, significance at 0.90 - Poland).

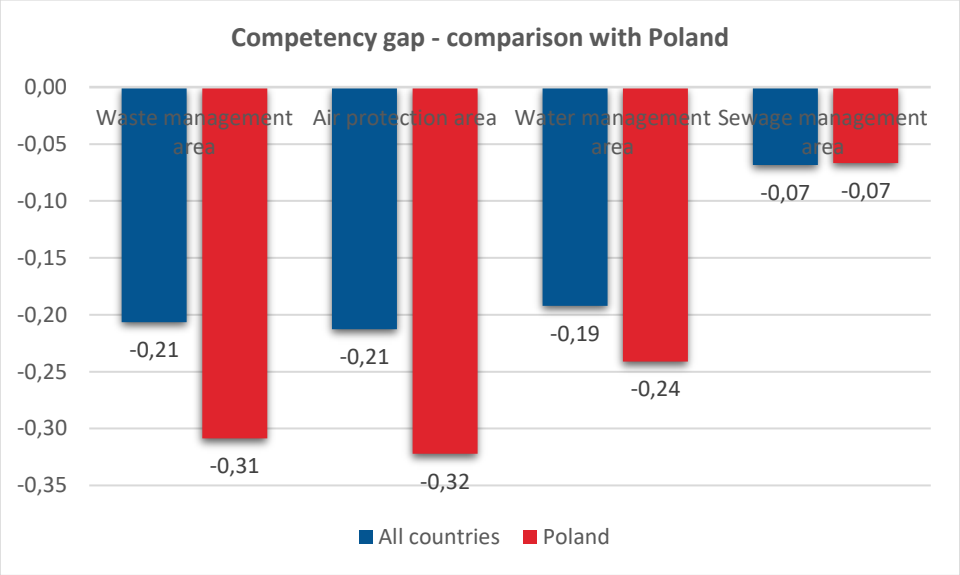
Figure 104: Level of relevance of competences - comparison with Poland



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

Within the competence gaps, there are no big differences between Poland and the results for all countries (Figure 105). The largest differences concern waste management (gap at the level of -0.21 - all countries, gap at the level of -0.31 - Poland) and air protection (gap at the level of -0.21 - all countries, gap at the level of -0.32 - Poland).

Figure 105: Level of competence gap in individual areas - comparison with Poland

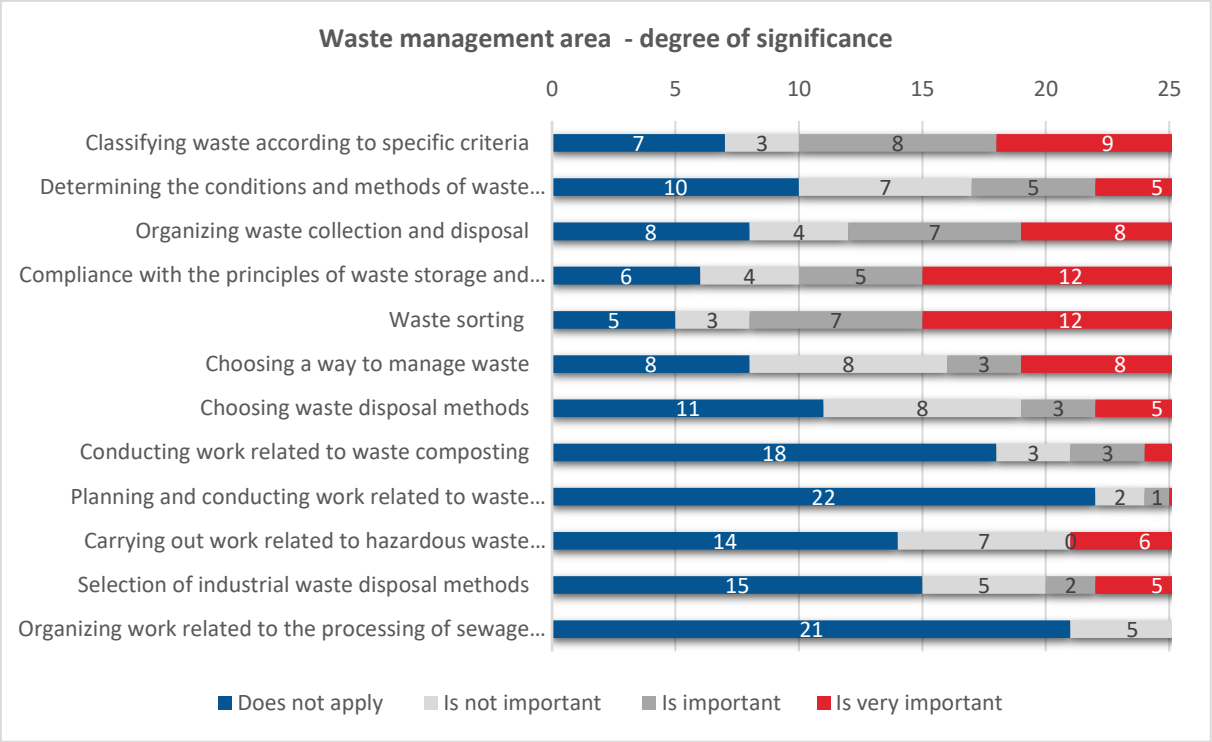


Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

8.1.1. Waste management area

In the most important area, i.e. waste management, there are not many competencies that most companies would assign great importance to (Figure 106). Skills were the highest: Waste sorting (12 - very important, 7 - important), Observing the principles of waste storage and storage (12 - very important, 5 - important), Classification of waste according to specific criteria (9 - very important, 8 - important), Organizing waste collection and disposal (8 - very important, 7 - important).

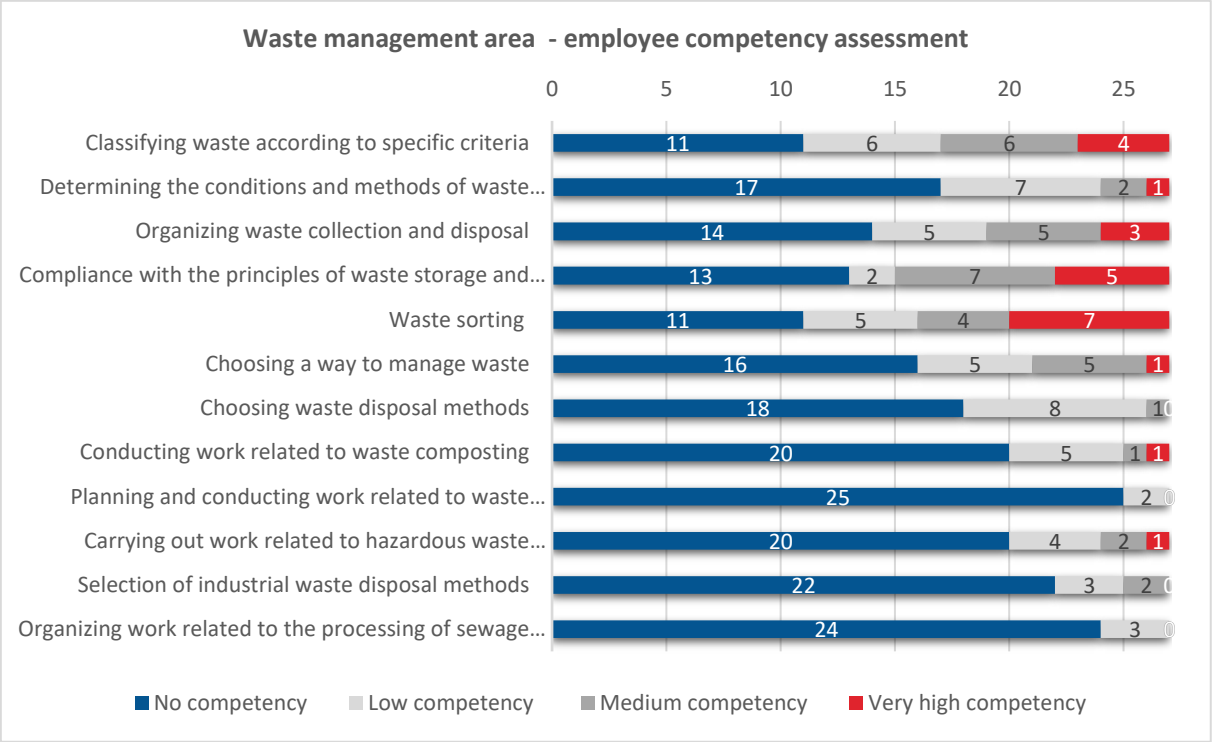
Figure 106: Level of relevance of waste management competences - Poland



Source: Own study based on the findings of the survey, n=27; n - number of companies surveyed

In the area of waste management, the level of competence of employees is rather low. The greatest competence deficits concern Planning and carrying out works related to waste incineration and plant operation (25 companies - lack of competence, 2 companies - low competence), Organizing works related to sewage sludge treatment and plant operation (24 companies - lack of competence, 3 - low competence), Selecting methods of industrial waste disposal (22 companies - lack of competence, 3 companies - low competence, 2 companies - medium competence). The competences with respect to which most of the statements about high or medium skills of the employees appeared were: Compliance with the rules of waste storage and disposal (5 companies - very high competences, 7 companies - medium competences), Waste sorting (7 companies - very high competences, 7 companies - medium competences) - Figure 107.

Figure 107: Level of competence of employees in the field of waste management – Poland



Source: Own study based on the findings of the survey, n=27; n - number of companies surveyed

Table 22 presents detailed data on the level of competence gaps in relation to waste management skills. As indicated by the data contained in the table, the largest competence gaps, understood as the difference between the level of materiality of the competences and the actual skills possessed by the employees, are visible in the Selection of waste management methods, Selection of waste disposal methods, Selection of industrial waste disposal methods - the gaps in the indicated competences were at -0.41.

Table 22: Specific competence gaps in waste management - Poland

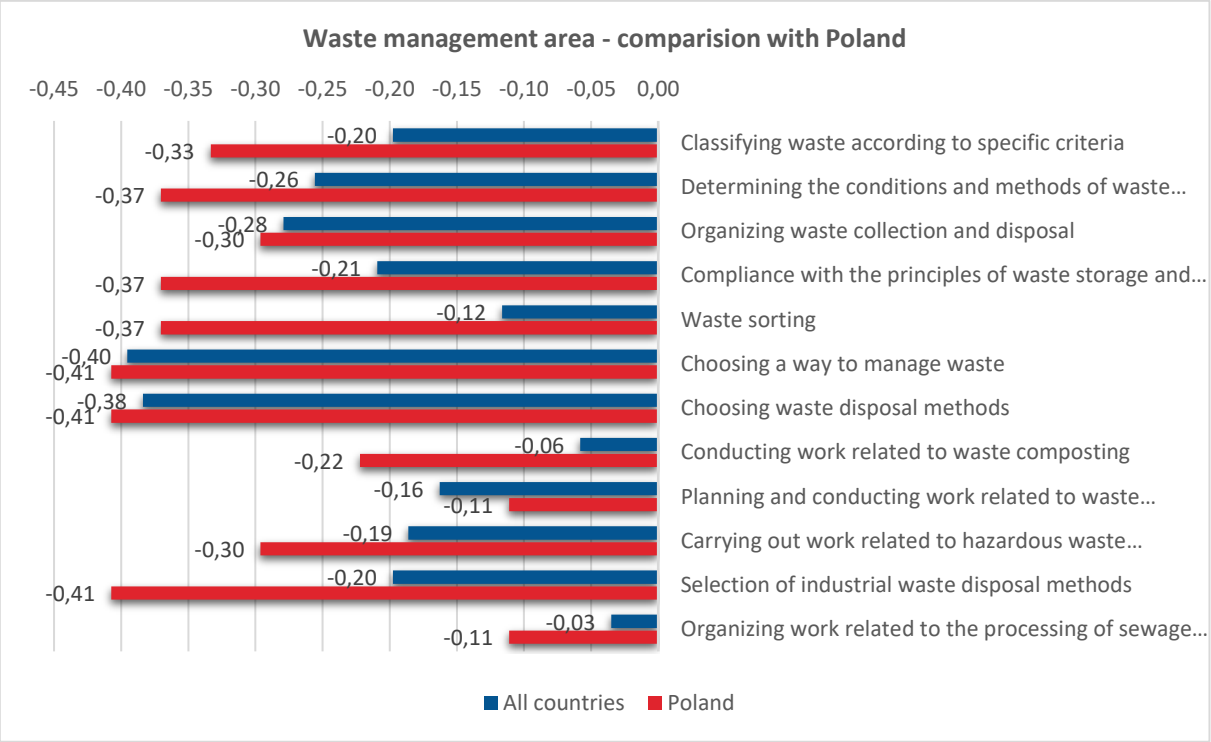
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Waste management area	**1,16**	**0,85**	**-0,31**
1	Classifying waste according to specific criteria	1,70	1,37	-0,33
2	Determining the conditions and methods of waste disposal	1,19	0,81	-0,37
3	Organizing waste collection and disposal	1,56	1,26	-0,30

4	Compliance with the principles of waste storage and storage	1,85	1,48	-0,37
5	Waste sorting	1,96	1,59	-0,37
6	Choosing a way to manage waste	1,41	1,00	**-0,41**
7	Choosing waste disposal methods	1,07	0,67	**-0,41**
8	Conducting work related to waste composting	0,67	0,44	-0,22
9	Planning and conducting work related to waste incineration and operation of incineration plants	0,37	0,26	-0,11
10	Carrying out work related to hazardous waste management	0,93	0,63	-0,30
11	Selection of industrial waste disposal methods	0,89	0,48	**-0,41**
12	Organizing work related to the processing of sewage sludge and the operation of equipment	0,30	0,19	-0,11

Source: Own study based on the findings of the survey, n=27; n - number of companies surveyed

Comparing the level of competence gaps concerning Poland and the average results from all countries, it can be seen that the discrepancies are not large in most cases (Figure 108). Clearly different opinions are related to the issue of Waste Sorting (gap at the level of -0.12 - all countries, gap at the level of -0.37 - Poland) and Industrial Waste Selection (gap at the level of -0.20 - all countries, gap at the level of -0.41 - Poland).

Figure 108: Specific competence gaps in waste management - comparison with Poland

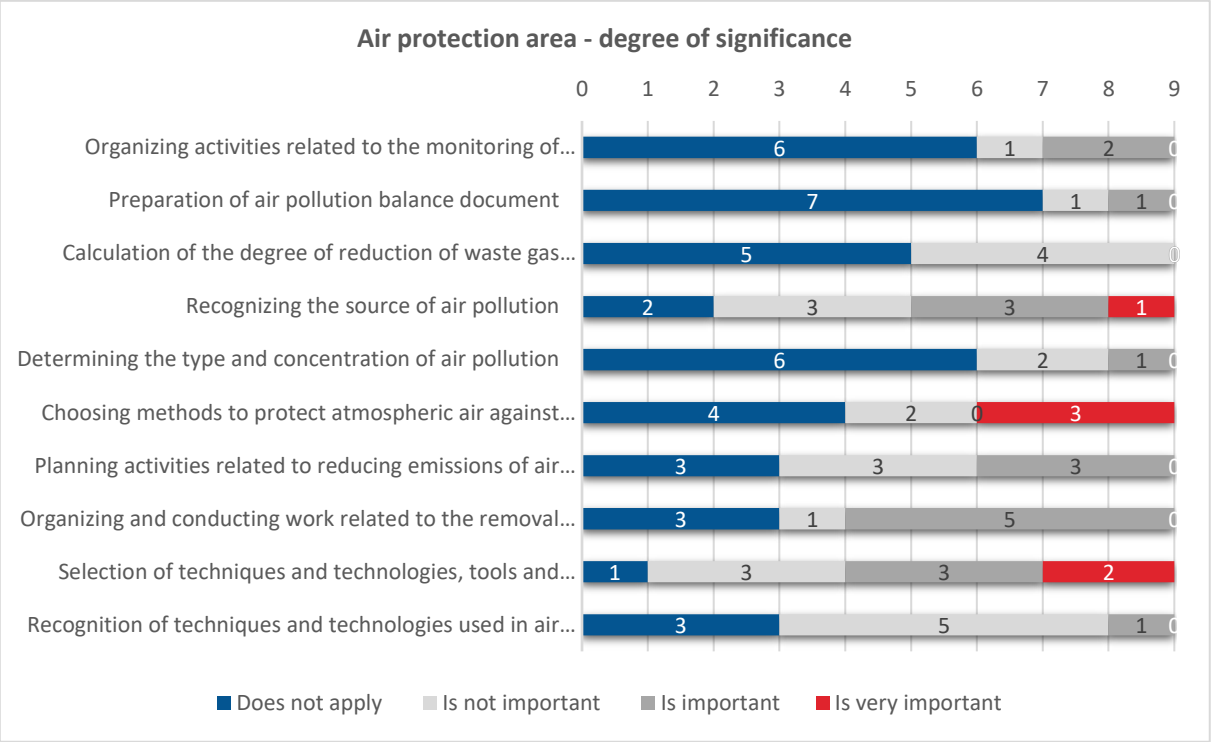


Source: Own study based on the findings of the survey, n=27; n - number of companies surveyed

8.1.2. The air protection area

Figure 109 presents entrepreneurs' opinions on the state of competence of employees in the area of air protection. Responses indicating low importance of the competences concerned mainly: Calculation of the degree of reduction of waste gas pollution (4 companies), Recognition of techniques and technologies used in air protection (5 companies). The largest number of answers indicating the importance of the competence concerned the Selection of methods of air protection against pollution (3 answers - very important), Selection of techniques and technologies, tools and materials for air purification, depending on the properties of the removed pollutants and the conditions of the process (2 answers - very important, 3 answers - important), Organizing and conducting works related to the removal of pollutants from the air (5 answers - important).

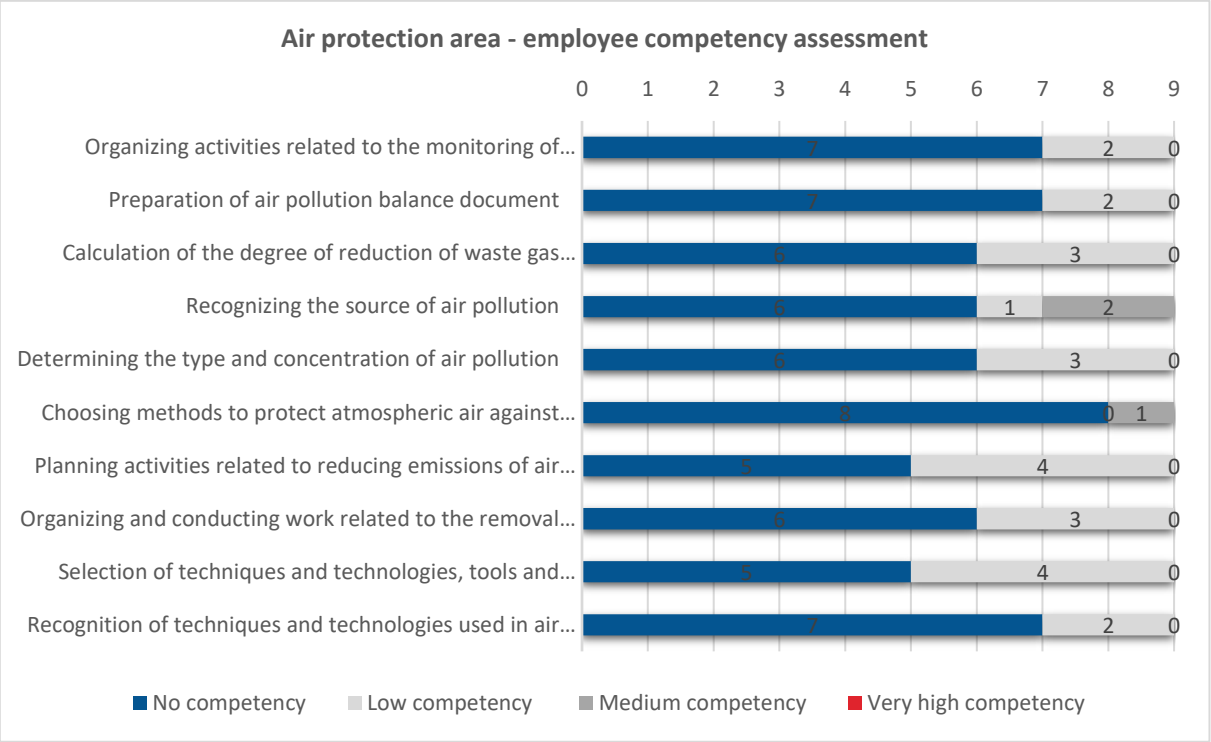
Figure 109: Level of relevance of competences in the field of air protection - Poland



Source: Own study based on the findings of the survey, n=9; n - number of companies surveyed

Entrepreneurs when asked about the level of competence of their employees in the field of air protection, assessed practically all skills poorly (Figure 110). The largest number of answers indicating lack of competence appeared in relation to Selection of methods of air protection against pollution (8 answers), Organization of activities related to monitoring of air pollution (7 answers), Preparation of air pollution balances (7 answers), Recognition of techniques and technologies used in air protection (7 answers). Individual indications of average competence were related to Identifying the source of air pollutants (2 answers) and Selecting methods of air protection against pollution (1 answer).

Figure 110: Employees' level of competence in the field of air protection - Poland



Source: Own study based on the findings of the survey, n=9; n - number of companies surveyed

Table 23 presents data on specific competence gaps in air protection skills. As the results show, the largest competence gaps were related to the Selection of methods of air protection against pollution and the Selection of techniques and technologies, tools and materials for air purification depending on the properties of the removed pollutants and process conditions.

Table 23: Specific competence gaps in the field of air protection - Poland

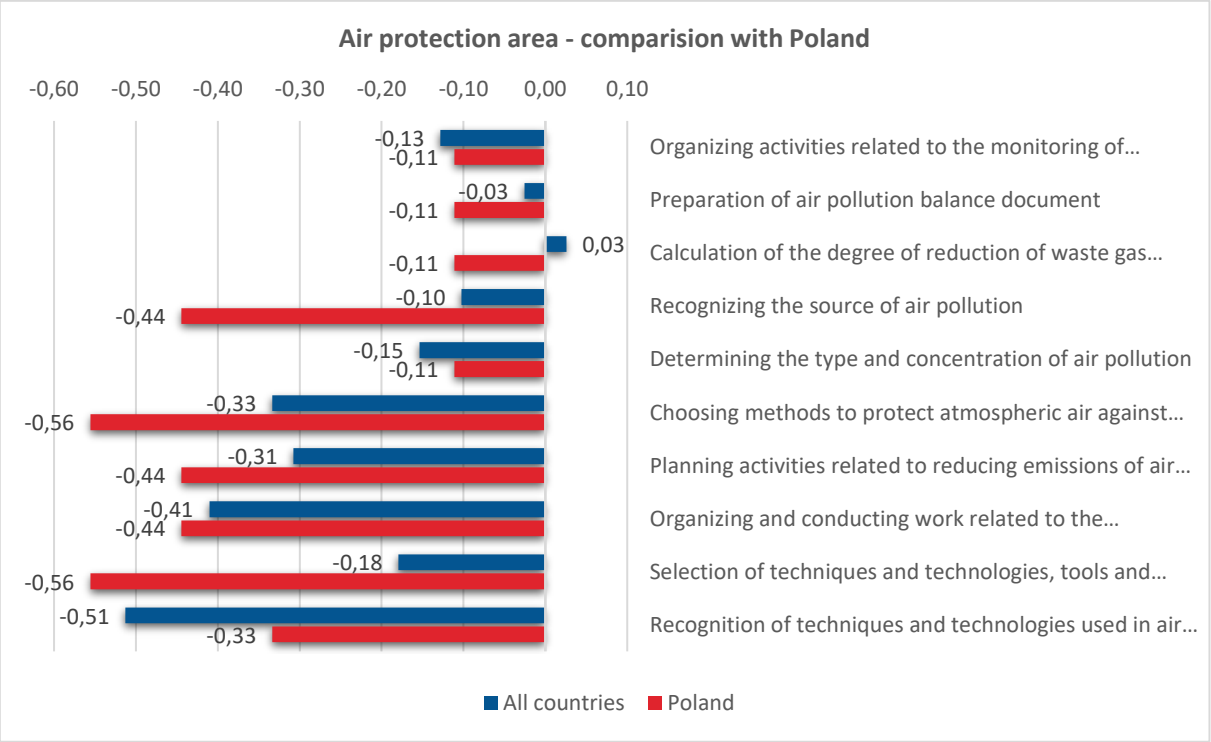
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Air protection area	**0,90**	**0,58**	**-0,32**
1	Organizing activities related to the monitoring of atmospheric air pollution	0,56	0,44	-0,11
2	Preparation of air pollution balance document	0,33	0,22	-0,11
3	Calculation of the degree of reduction of waste gas impurities	0,44	0,33	-0,11
4	Recognizing the source of air pollution	1,33	0,89	-0,44

5	Determining the type and concentration of air pollution	0,44	0,33	-0,11
6	Choosing methods to protect atmospheric air against pollution	1,22	0,67	**-0,56**
7	Planning activities related to reducing emissions of air pollutants	1,00	0,56	-0,44
8	Organizing and conducting work related to the removal of atmospheric pollution	1,22	0,78	-0,44
9	Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions	1,67	1,11	**-0,56**
10	Recognition of techniques and technologies used in air protection	0,78	0,44	-0,33

Source: Own study based on the findings of the survey, n=9; n - number of companies surveyed

The analysis of data concerning competence gaps indicated by Polish companies and aggregate results from all countries reveals the largest discrepancies in such competencies as: Identification of the source of air pollution (competence gap at the level of -0.10 - all countries, competence gap at the level of -0.44 - Poland) and Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed pollutants and process conditions (competence gap at the level of -0.18 - all countries, competence gap at the level of -0.56 - Poland) - Figure 111.

Figure 111: Specific competence gaps in the field of air protection – comparison with Poland

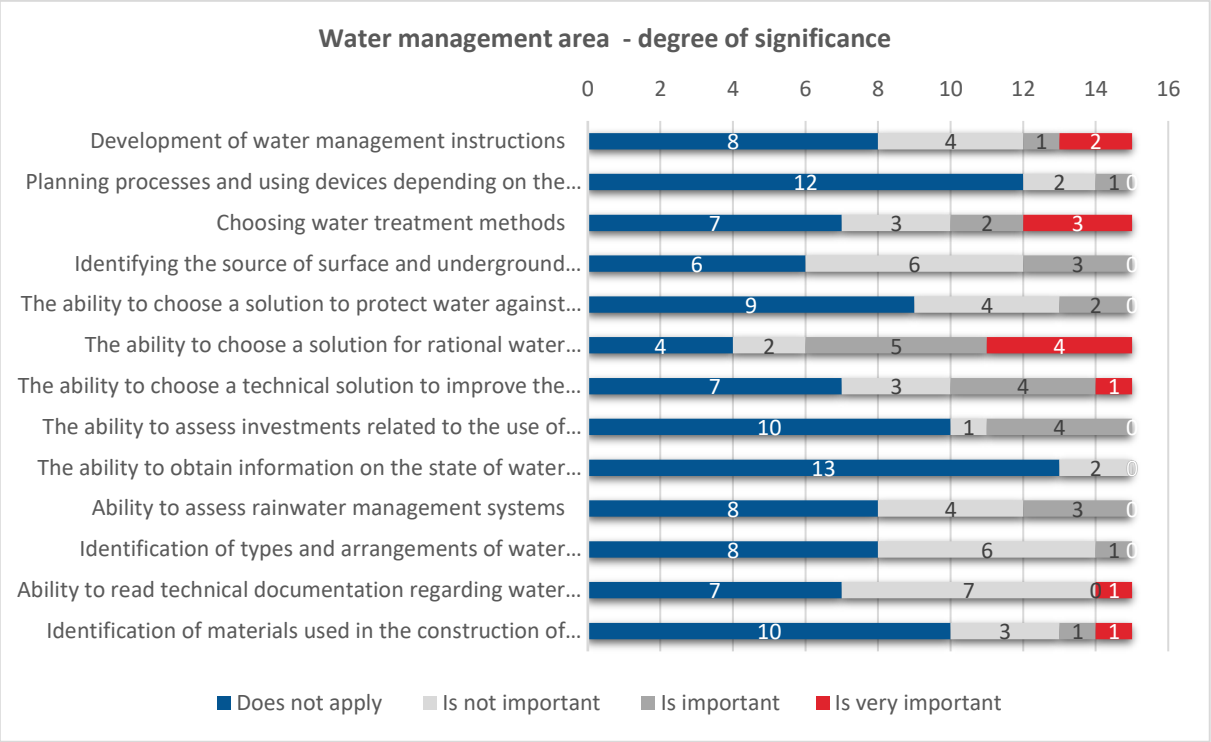


Source: Own study based on the findings of the survey, n=9; n – number of companies surveyed

8.1.3. Water management area

Competences in the area of water management, which were most often considered insignificant from the point of view of enterprises, were: Ability to read technical documentation on water management (7 companies), Recognition of types and systems of water supply networks on the enterprise premises (6 companies) and Recognition of the source of surface and underground water pollution (6 companies). The most important was assigned The ability to select a solution for rational water consumption (4 answers - very important, 5 - important) - Figure 112.

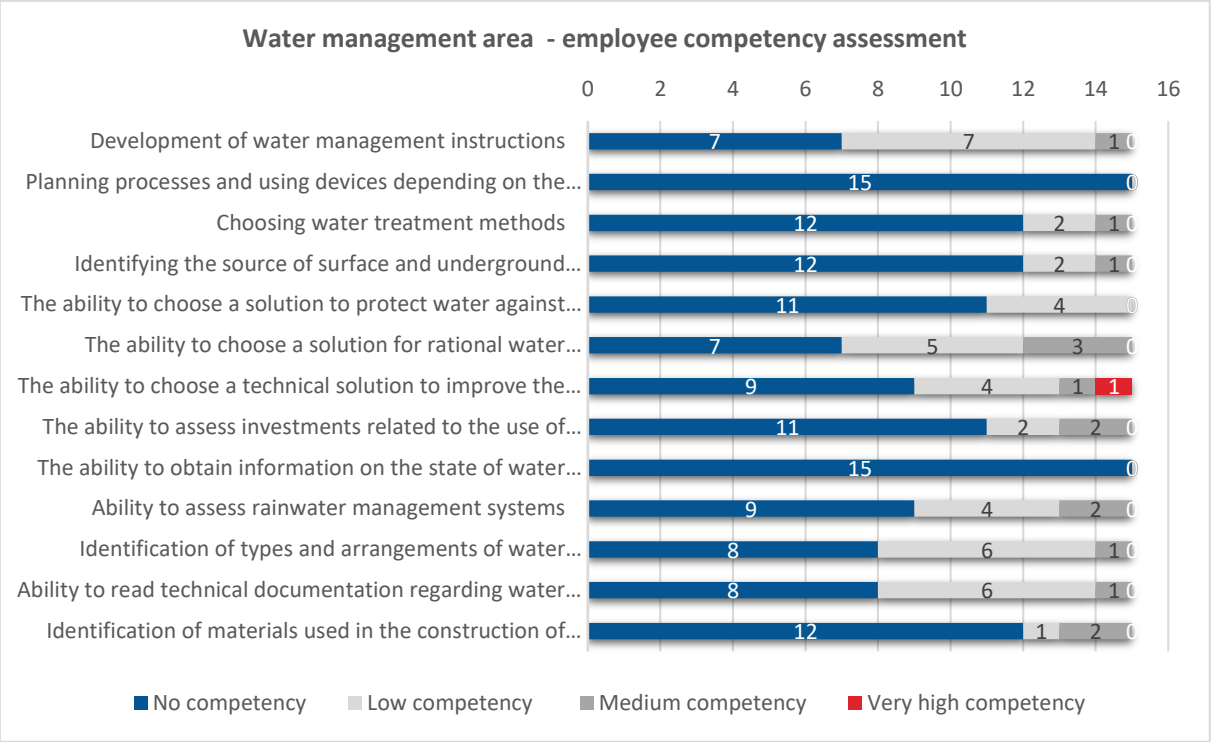
Figure 112: Level of relevance of competences in the field of water management - Poland



Source: Own study based on the findings of the survey, n=15; n - number of companies surveyed

The lowest level of competence of the employees of the surveyed companies in the area of water management concerns Planning processes and equipment depending on the purpose and chemical composition (15 answers indicate lack of competence), Ability to obtain information on the condition of water resources, available types of surface and groundwater, types of water intakes (15 answers). It should be stressed, however, that the level of skills within all competences was assessed very low (Figure 113).

Figure 113: Level of competence of employees in the field of water management - Poland



Source: Own study based on the findings of the survey, n=15; n - number of companies surveyed

The results of the conducted research indicate that the largest competence gaps in the area of water management concern Selection of water treatment methods (competence gap at the level of -0.73), Ability to select a solution for rational water consumption (competence gap at the level of -0.67), Identification of surface water and groundwater pollution source (competence gap at the level of -0.53) - Table 24.

Table 24: Specific competence gaps in water management - Poland

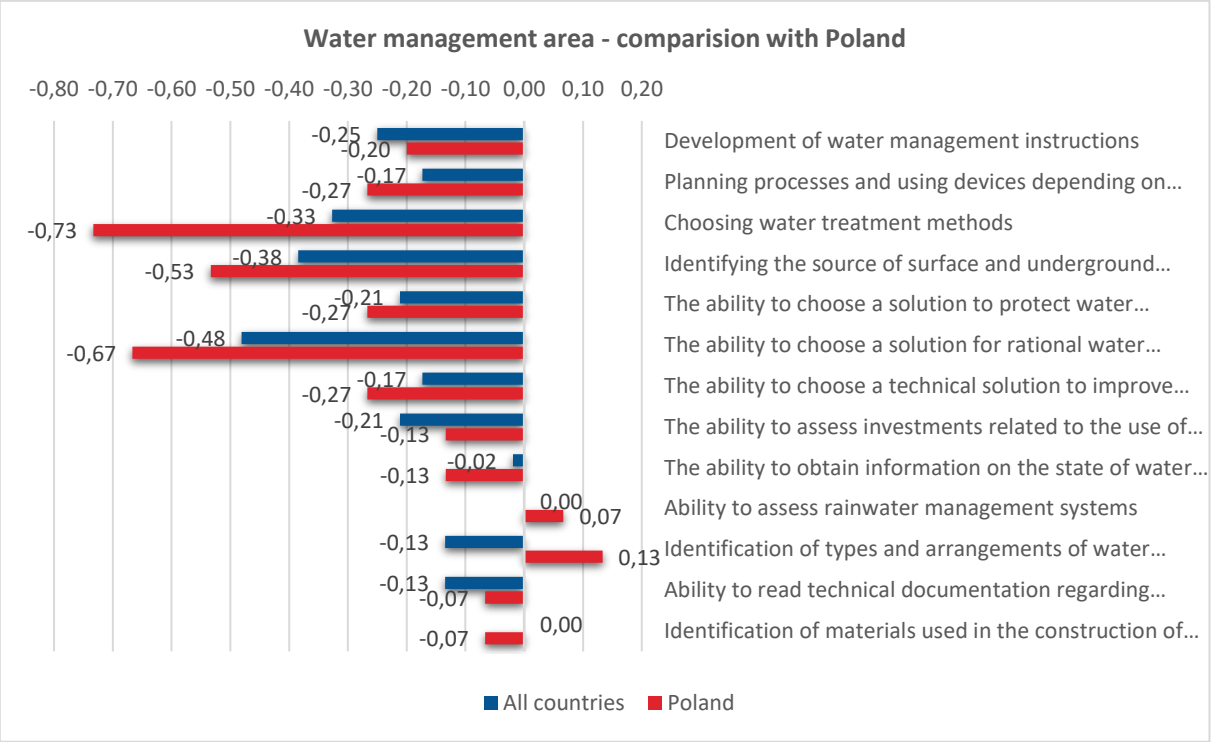
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Water management area	**0,72**	**0,48**	**-0,24**
1	Development of water management instructions	0,80	0,60	-0,20
2	Planning processes and using devices depending on the purpose and chemical composition	0,27	0,00	-0,27
3	Choosing water treatment methods	1,07	0,33	**-0,73**
4	Identifying the source of surface and underground water pollution	0,80	0,27	**-0,53**

5	The ability to choose a solution to protect water against secondary pollution	0,53	0,27	-0,27
6	The ability to choose a solution for rational water consumption	1,60	0,93	**-0,67**
7	The ability to choose a technical solution to improve the quality of captured water	0,93	0,67	-0,27
8	The ability to assess investments related to the use of groundwater resources	0,60	0,47	-0,13
9	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes	0,31	0,18	-0,13
10	Ability to assess rainwater management systems	0,67	0,73	0,07
11	Identification of types and arrangements of water supply networks on the company's premises	0,53	0,67	0,13
12	Ability to read technical documentation regarding water management	0,67	0,60	-0,07
13	Identification of materials used in the construction of plumbing	0,53	0,47	-0,07

Source: Own study based on the findings of the survey, n=15; n - number of companies surveyed

Among the differences in the level of competence gaps between Poland and the aggregate result within all countries, one competence is the most prominent one concerning the selection of water treatment methods. The competence gap for all countries reached -0.33 and for Poland -0.73 (Figure 114).

Figure 114: Specific competence gaps in water management - comparison with Poland

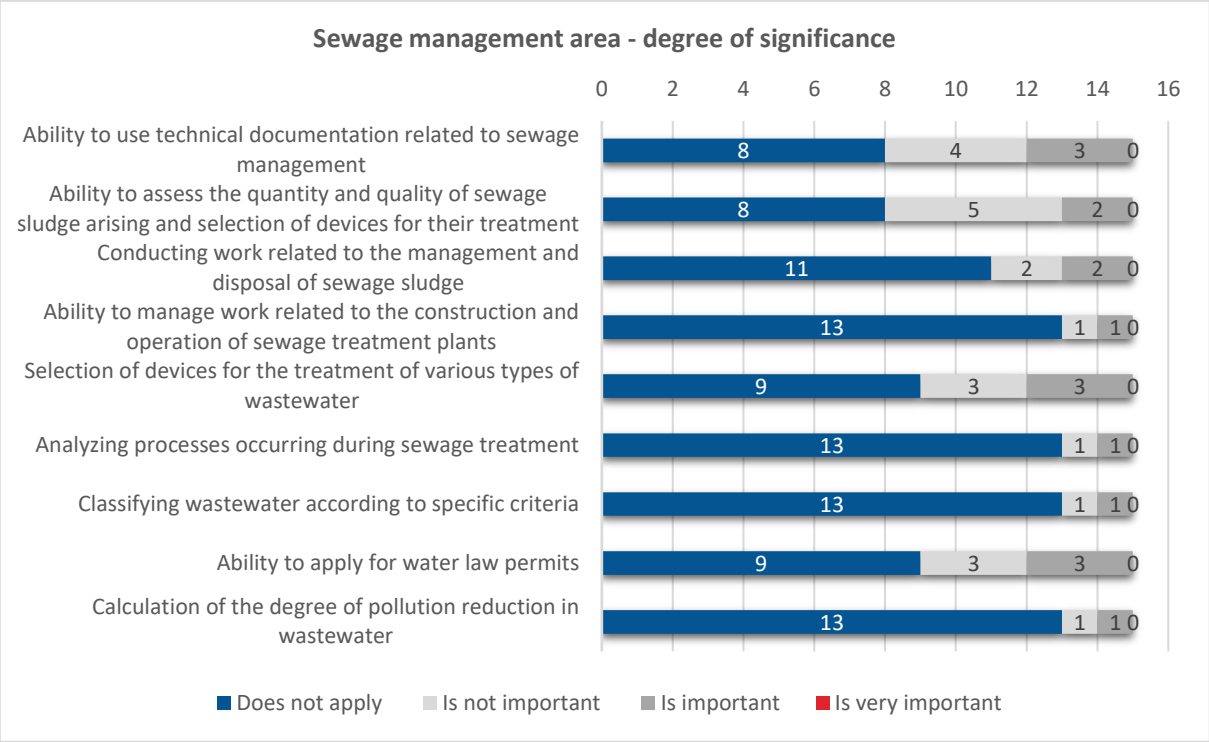


Source: Own study based on the findings of the survey, n=15; n - number of companies surveyed

8.1.4. Sewage management area

The majority of competences in the area of sewage management were considered by the surveyed entrepreneurs to be irrelevant or insignificant (Figure 115). The most indications of the importance of competences concerned the Ability to use technical documentation related to sewage management (3 companies), Selection of sewage treatment plants of various types (3 companies) and Ability to apply for water law related permits (3 companies).

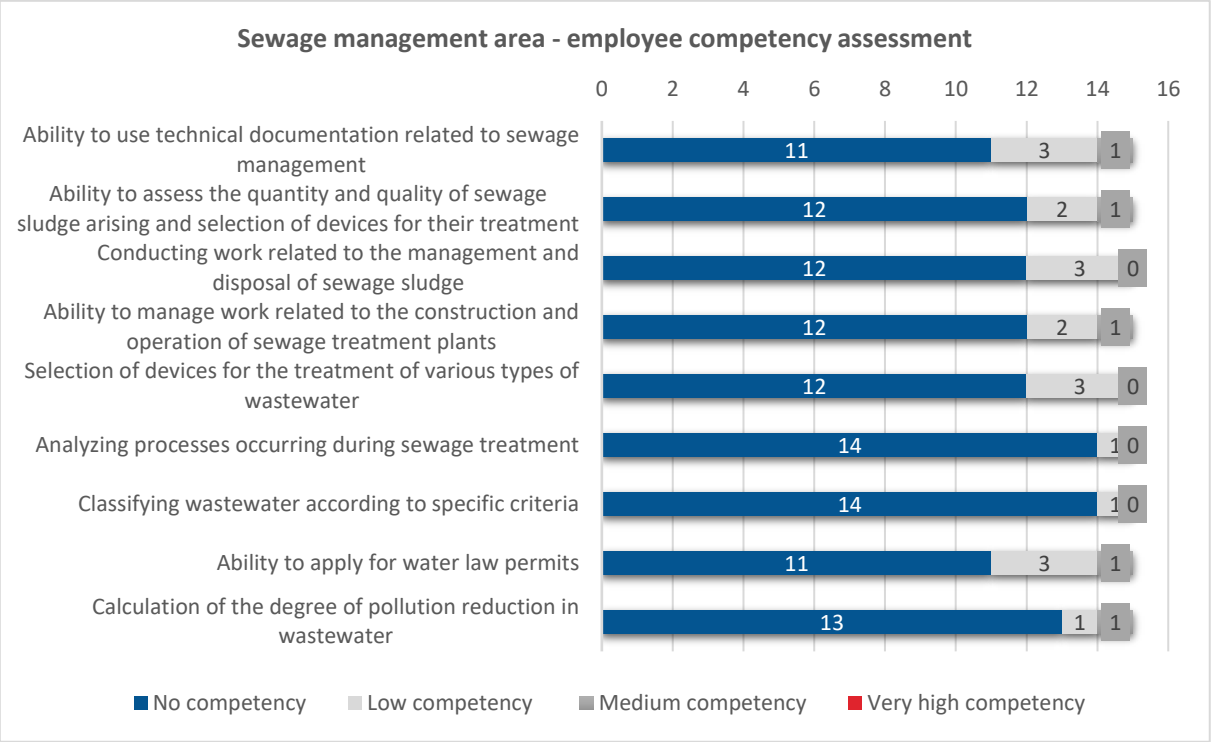
Figure 115: Level of relevance of competences in the field of wastewater management - Poland



Source: Own study based on the findings of the survey, n=15; n - number of companies surveyed

For all these competences related to wastewater management, the majority of respondents indicated that employees lacked the skills in this area (Figure 116). Individual responses of the companies indicating the average level of competence concerned the Ability to use technical documentation related to sewage management, Ability to assess the quantity and quality of sewage sludge generated, selection of equipment for its treatment, Ability to manage works related to construction and operation of sewage treatment plants, Ability to apply for water permits, Calculation of pollution reduction in sewage.

Figure 116: Employees' level of competence in the field of wastewater management - Poland



Source: Own study based on the findings of the survey, n=15; n - number of companies surveyed

In the area of wastewater management, there were no high level of competence gaps (Table 25). The largest competence gaps were related to the ability to assess the quantity and quality of sewage sludge generated, the selection of sewage treatment facilities (gap at -0.27), the ability to use technical documentation related to sewage management (gap at -0.20), the selection of facilities for treatment of various types of sewage (gap at -0.20).

Table 25: Specific competence gaps in sewage management - Poland

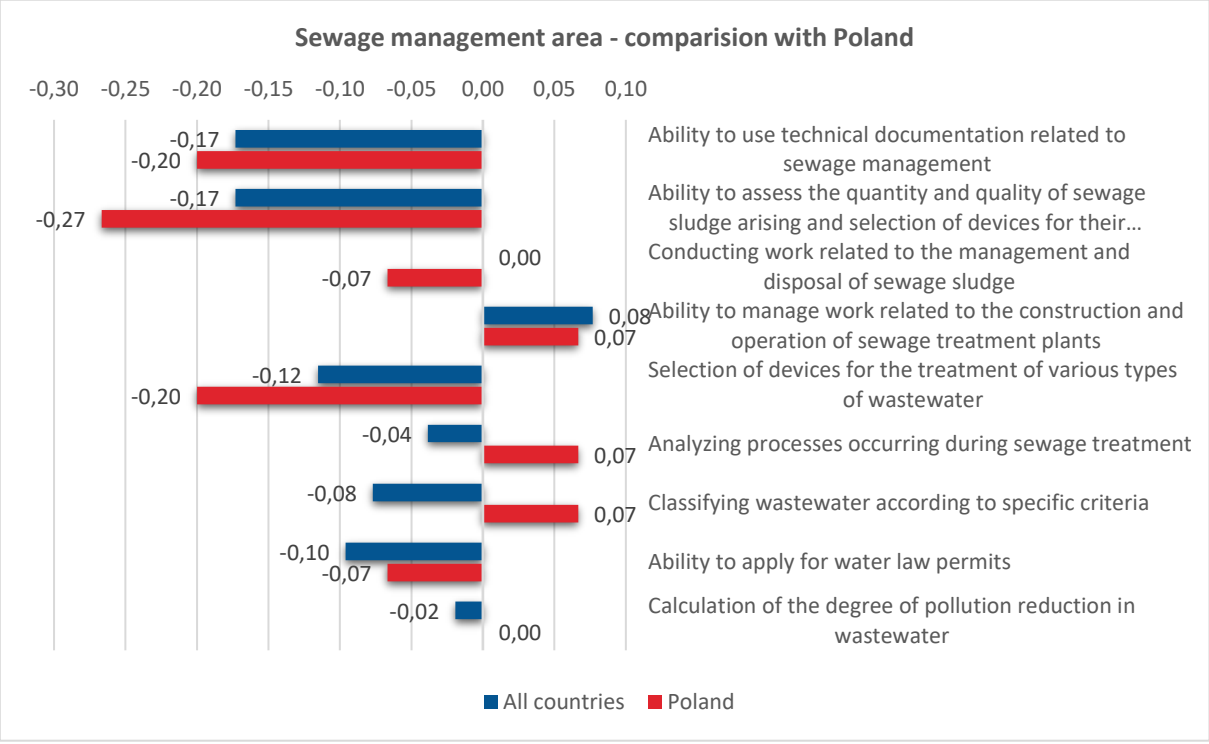
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Sewage management area	**0,41**	**0,34**	**-0,07**
1	Ability to use technical documentation related to sewage management	0,67	0,47	**-0,20**
2	Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment	0,60	0,33	**-0,27**
3	Conducting work related to the management and disposal of sewage sludge	0,40	0,33	-0,07

4	Ability to manage work related to the construction and operation of sewage treatment plants	0,20	0,27	0,07
5	Selection of devices for the treatment of various types of wastewater	0,60	0,40	**-0,20**
6	Analyzing processes occurring during sewage treatment	0,20	0,27	0,07
7	Classifying wastewater according to specific criteria	0,20	0,27	0,07
8	Ability to apply for water law permits	0,60	0,53	-0,07
9	Calculation of the degree of pollution reduction in wastewater	0,20	0,20	0,00

Source: Own study based on the findings of the survey, n=15; n - number of companies surveyed

The biggest differences between the opinion of Polish entrepreneurs on the level of competence gaps and the averaged results concerning all countries appear in relation to two competences, which in the analysis concerning Poland reached a positive level: Analysis of processes occurring during wastewater treatment (competence gap at -0.04 - all countries, competence gap at 0.07 - Poland) and Classification of wastewater according to specific criteria (competence gap at -0.08 - all countries, competence gap at 0.07 - Poland) - Figure 117.

Figure 117: Specific competence gaps in sewage management - comparison with Poland



Source: Own study based on the findings of the survey, n=15; n - number of companies surveyed

8.2. Experts' opinions on environmental management needs

The next stage of the study was qualitative interviews with experts in environmental management. In Poland, the interviews were conducted with three experts, who were asked questions concerning optimization of costs incurred in the field of environmental management, training in environmental management, use of renewable energy sources and competence needs related to environmental management.

8.2.1. Optimisation of environmental management costs in SME enterprises

The experts were asked how important it is to **optimise costs in the field of environmental management in SMEs** and which aspects of environmental management (e.g. electricity, waste, water, sewage, heating) should be focused on when planning educational programmes. In the opinion of one of the respondents, *this is an important issue due to the priority of actions concerning environmental protection. It is worth to focus on the rational management (consumption) of energy, water and waste segregation* [1EP]. According to another expert, the issue of electricity and heating in particular should be focused: *surely every SME bears the costs of electricity and heating. Cost optimisation in this respect is the most common need and the focus should be on these areas* [3EP]. The topic of RES also appeared in the discussions: *At present it is necessary to focus on obtaining funds for renewable energy sources and to make entrepreneurs aware of the need to protect the environment and to install RES equipment* [2EP].

8.2.2. Renewable energy sources

It was also RES that was another area raised during the study, namely **the importance of the use of renewable energy sources (RES)** in the SME sector. Questions were also examined whether training in renewable energy sources (RES) for SMEs should be promoted and if so, to what extent (e.g. solar modules, heat pumps, solar collectors, biomass boilers).

The experts agreed that the use of RES is an extremely important issue: *RES are the most easily accessible and with the greatest potential for energy savings in SMEs, especially photovoltaics, solar collectors, wind power plants, also in connection with electrified means of transport. Also heat pumps. Use of biomass only for companies that have biomass at their disposal, e.g. as waste* [3EP]. One of the respondents stressed that RES is of the greatest importance for small companies. *The use of renewable energy sources (RES) for small companies is a very important issue, namely: the first issue will have a very positive impact on environmental protection, in the long run it will reduce the costs for electricity and heat and for the service/production produced. Therefore, training on renewable energy sources should be promoted in order to make employers aware of the benefits that will be achieved in the long term. Because at present many employers have doubts about the benefits* [2EP] - said the interlocutor. Among the aspects that, in the opinion of the respondents, it is worth to take into account when planning the training courses, there are also *training courses on the availability and conditions of RES installations* [1EP].

8.2.3. Assessing competence needs for environmental management

In the following part of the interview, experts were asked to **assess the specific competence needs related to environmental management in the SME sector**. They were to consider which competences of SME employees in **waste management** are relevant for the functioning of SME companies and which of them should be taken into account when planning educational programmes. The proposals included *waste classification, sorting, compliance with the rules of waste storage and disposal, methods of management and disposal of hazardous and industrial waste* [1EP], *knowledge of legal regulations concerning waste management and packaging* [3EP]. One of the respondents also pointed out problems related to unclear waste documentation: *at present, employers are confused about what to do with waste paperwork. The Regulation of the Minister of the Environment of 14.12.2012, 2014, 2015 and 2018, although it specifies what to do with the generated waste, it is so complex that not everyone can handle this problem. The planning of the training programme should primarily take into account what documentation should be kept by each individual employer, depending on the professional sector. The sectors producing waste in a given area should be discussed* [2EP].

The experts also considered which **competences of employees in the field of air protection** are important for the functioning of companies from the SME sector and worth taking into account when planning educational programmes. In the opinion of the respondents, particular attention should be paid to the *identification of air pollution sources, planning activities related to the reduction of air pollution emissions, selection of production technologies in accordance with the minimization of air pollution emissions (extraction and filtration systems)* [1EP], *organization of activities related to the monitoring of air pollution, preparation of air pollution balances, calculation of the degree of reduction of waste gas pollution, determination of the type and concentration of air pollution, selection of methods of air protection against pollution* [3EP].

In order to make employers aware of the importance of the atmospheric air that surrounds us, and all the indicated topics, it is necessary to discuss with each company introducing into the atmosphere pollutants that are produced during the technological process during production or service [2EP] - one of the experts expressed his opinion.

Another issue was the specific **competences of employees in the field of water management** and their relevance to the functioning of companies from the SME sector and planning of educational programmes. The experts listed such elements as: *identification of surface and ground water pollution sources, knowledge and selection of production technologies that prevent these threats and help in rational use of water resources* [1EP], *selection of water treatment methods, ability to select a solution for water protection against secondary contamination* [2EP], *ability to select a solution for rational water use, ability to select a technical solution for improving the quality of intake water, ability to evaluate investments related to the use of groundwater resources, knowledge and ability to use water saving technologies and methods* [3EP].

They were asked what **competences of employees in the field of sewage management** are important for companies from the SME sector and planning educational programmes. According to the experts, the main emphasis should be placed on *classifying sewage according to specific criteria, the ability to select sewage treatment facilities existing in the plant* [1EP], *the ability to select facilities for treatment of various types of sewage* [2EP], *the ability to assess the quantity and quality of sewage sludge generated, the selection of facilities for its treatment, the performance of sewage sludge management and disposal works, the ability to apply for*

water permits, the ability to operate decentralized sewage treatment plants, cleaning and reuse of grey water [3EP].

The last issue raised during the expert interviews was the **competence of employees in the field of recycling, circular economy and environmental management**, taking into account their importance from the point of view of the functioning of companies from the SME sector and the creation of educational programmes. As the interviewees stated, particularly important issues were *knowledge of reuse of materials and knowledge of recycling techniques. Knowledge about the implementation of Corporate Social Responsibility principles in a company* [1EP], *knowledge and skills in the methods and technologies of circular economy* [2EP], *knowledge and skills concerning preparation and reuse of materials and consumables, knowledge about the selection and use of recycling techniques, knowledge and skills in the methods and technologies of circular economy, knowledge and skills to develop Corporate Social Responsibility in companies, knowledge and skills to use environmental economy in marketing and advertising, knowledge and skills for the development of new markets and areas of activity in the green economy* [3EP].

8.3. Examples of good practice in environmental management

The last stage of the conducted analyses was desk research, i.e. study of existing data, which consisted in the analysis of texts and materials available on the Internet describing examples of good practices in green education implemented in the country. Descriptions of examples of good practices implemented in Poland are presented below.

"ecoProfession as a strategic partnership for adjusting the vocational education systems to the challenges of green economy"[39]

The aim of the project, **co-financed under the European Union's Erasmus+ programme**, is the development and implementation of new vocational education and professional training programmes in 3 key professions related with green economy in Poland, Germany, and Italy. The target group of the project included vocational school students, teachers, and instructors, as well as craftsmen. The project's actions included the following components:

- Establishing innovative approaches, training programmes, and internship programmes for 3 key profession in the partnership's scope: food processing (food technologists specializing in: organisation and supervision of organic food production), construction services (insulation fitters specializing in: thermal modernisation and carbon print reduction), renewable energy sources (electricians specialising in: integrating energy systems with renewable energy equipment) in three languages;

[39] Katalog „EDUinspiracje Konkurs 2018", © Fundacja Rozwoju Systemu Edukacji, Warszawa 2018, http://bfkk.pl, [access: 04.03.2020]

- testing the developed models in partner countries - mobility;
- adjusting and implementing the models, modified and supplemented in the project, based on the specificity of the industries in the partnership countries (dissemination through workshops). The project not only responded to the needs of the target groups (vocational school students, teachers, and instructors, and the trades persons involved in dual education), but mainly addressed the demands related with the development of green economy.

The undertaking was carried out by Bialystok Foundation of Professional Training (BFKK) in cooperation with partners from Italy and Germany. The curricula of three professions - electrician, building insulation fitter, and food technician - were successfully modified to face the challenges of an environmentally focused, green economy. The undertaking employed locally oriented changes related to dividing a profession into professional tasks and identifying those which relate to green economy. "Greening" a profession is focused on exactly these elements - they are implemented into the curriculum in the form of new content or internships carried out in local businesses involved in environmental activities. The methodology of introducing new educational content in a vocational training programme without changing the effects of education outlined in the core curricula may be used for updating or making other professions green as well. The effects of the project are not only significant for schools which were directly involved in the undertaking - they can also be utilised by other institutions which train people in the same or other professions and trades, which are willing to supplement their curricula with ecological content as well as information on new trends or technologies. Project Partners. Poland: BFKK – Leader, Amicus Society, The Economic Foundation of Gdynia, Janusz Groszewski Electrical School Complex in Białymstoku. Germany: Cottbus Chamber of Crafts, EkoConnect Dresden, Italy: Ufficio Scolastico Regionale Per Il Veneto, Coldiretti Confederation. Foundation for the Development of the Education System awarded the EDUinspirations first prize to BFKK in the "Vocational Education" category for the project "ecoPROFESSION - strategic partnerships for adapting the system of vocational education to the challenges of green economy". The Educational awards given by the Foundation for the Development of the Education System is one of its most important initiatives aimed at selecting the most valuable projects financed by programmes managed by the Foundation, especially in terms of promoting and implementing the results of activities.

„Energize to Learn" - educational programme by PGNiG TERMIKA[40]

PGNiG TERMIKA SA is a large Polish company operating in the heating industry. For years it has been cooperating with the educational sector at various levels and in many forms. The company's activities focus mainly on vocational education in the area of energy. The main reason for establishing cooperation with institutions involved in vocational education stemmed from the recognition of the company's issues in relation with the unfavourable conditions in the Polish labour market as well as a noticeable lack of opportunities for education in the energy. PGNiG TERMIKA's educational programme, "Energize to learn", started in 2019 and was aimed at students of technical middle schools. The main areas of activity include Warsaw, Radom and Siedlce. "Energize to Learn" educational programme is focused on ensuring the company access to qualified middle technical staff and finding junior technical workers who know the specifics of working in the energy

[40] *Współpraca szkolnictwa zawodowego z przedsiębiorcami w województwie dolnośląskim*. Raport opracowany na zlecenie Dolnośląskiego Wojewódzkiego Urzędu Pracy w Wałbrzychu, Wałbrzych, listopad 2019

sectors and the company's plants, and are aware of the skills which may be necessary in their future jobs. Also, the implementation of the programme is aimed at popularizing the jobs of energy technician and electrical technician among young people.

University course in Circular Economy (Silesian University)[41]

Silesian University is one of the first universities in Poland to offer a course in Circular Economy. The course is aimed all students who are interested in modern systems of economy, focusing on recycling and minimal use of resources. This is a remarkably modern trend which will soon become commonplace in most countries in the world. Consequently, anyone who decides to study in this field will gain a prospective, interesting, and stable profession. If you are ambitions and want to have a real impact on improving the condition of the natural environment, this course may be the right choice. In your studies you will learn about the various aspects of circular economy. You will start with exploring the earth's natural resources and their function in manufacture. Then you will learn how to reuse industrial products to contribute to the trends of environmental protection. To do this, you will have to go deep into the intricacies of chemical, biological and physical processes which make it possible to recover valuable resources. Also, you will become familiar with methods of assessing environmental safety of new products and technologies, and you will get acquainted with technologies involved in the creation of goods in line with the principles of circular economy. During the three-year course, students will also develop their practical skills. During numerous demonstrations, projects and team activities they will prepare for their regular work. All lectures and classes are conducted by exceptional scientists and practitioners in the field who will share years of valuable experience with their students.

[41] The Circular Economy CYCLE project, http://cyclecc.eu, Politechnika Śląska, https://www.polsl.pl, [access: 04.03.2020]

BFKK competencies to work

WWW&CE

Water, Waste & Circular Economy

Hungary

Magyarország

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WWW&CE

Hungary

Research in Hungary was conducted by the Hungarian Craftsmen's Association in Budapest; the KONTIKI Association in Budapest. The survey was conducted by the Hungarian Association of Craftsmen in Budapest; the KONTIKI Association in Budapest. 11 companies operating in Hungary participated in the survey. The largest number of them, 9 of which were microenterprises, the remaining 2 were small enterprises. The industries in which the analysed companies operate are architecture (3 companies), industry (2 companies), transport, storage and communications (2 companies), other services, social and personal activities (2 companies), trade and repairs (1 company) and business services (including business services), real estate (1 company). This chapter presents Hungarian good practices in the development of green competence: Eco-schools - Education for sustainable development; Adventure Energy (Energiakaland); Waste Academy; Save@work - promoting sustainable working, living and consumption.

Hungary Magyarország

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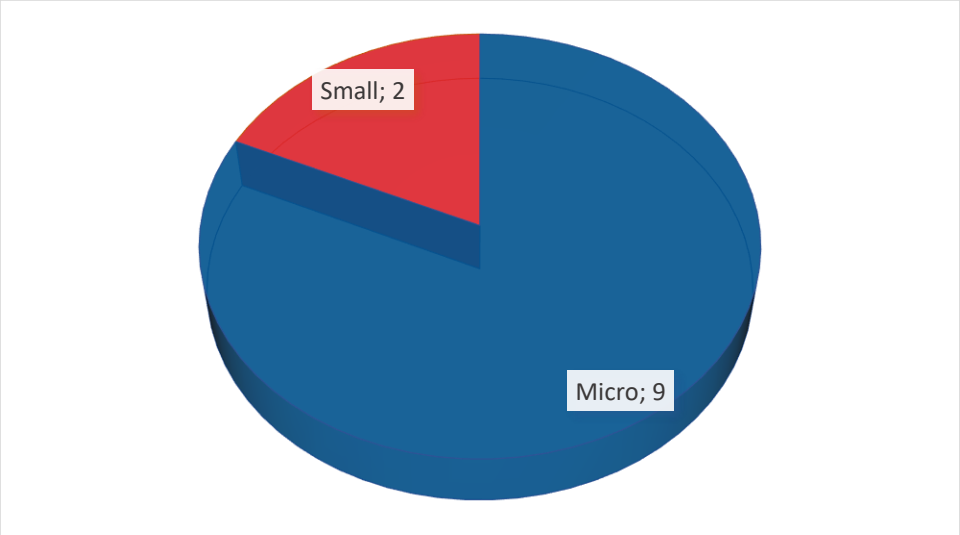
9. Hungary

9.1. Results of quantitative studies on environmental management needs

The survey involved 11 companies operating in Hungary. The largest number of them, 9 of which were microenterprises, the remaining 2 were small enterprises (Figure 118).

Figure 118: Company size - Hungary



Source: Own study based on the findings of the survey, n=11; n - number of companies surveyed

The industries in which the analysed companies operate are architecture (3 companies), industry (2 companies), transport, storage and communications (2 companies), other services, social and individual activities (2 companies), trade and repairs (1 company) and business services (including services for companies), real estate (1 company) - Figure 119.

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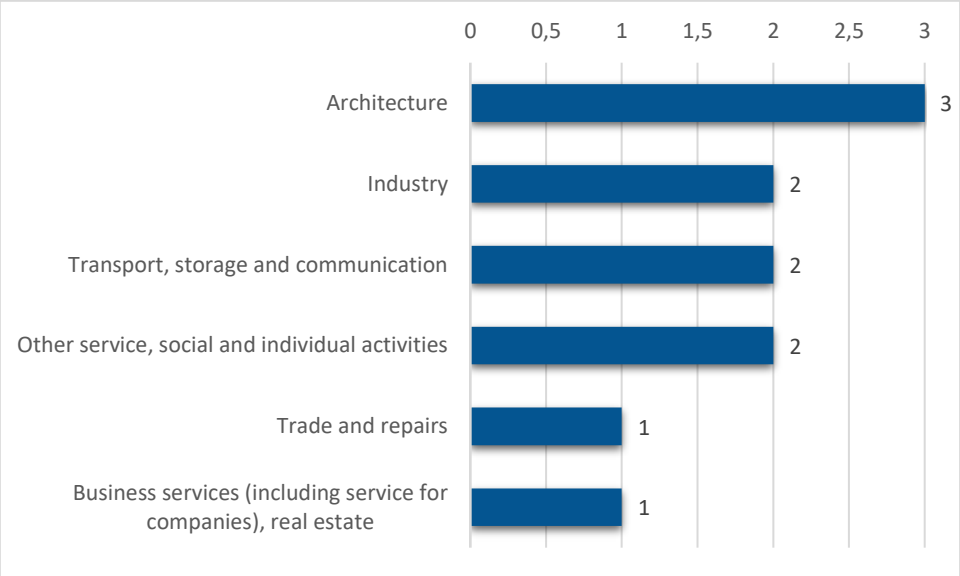
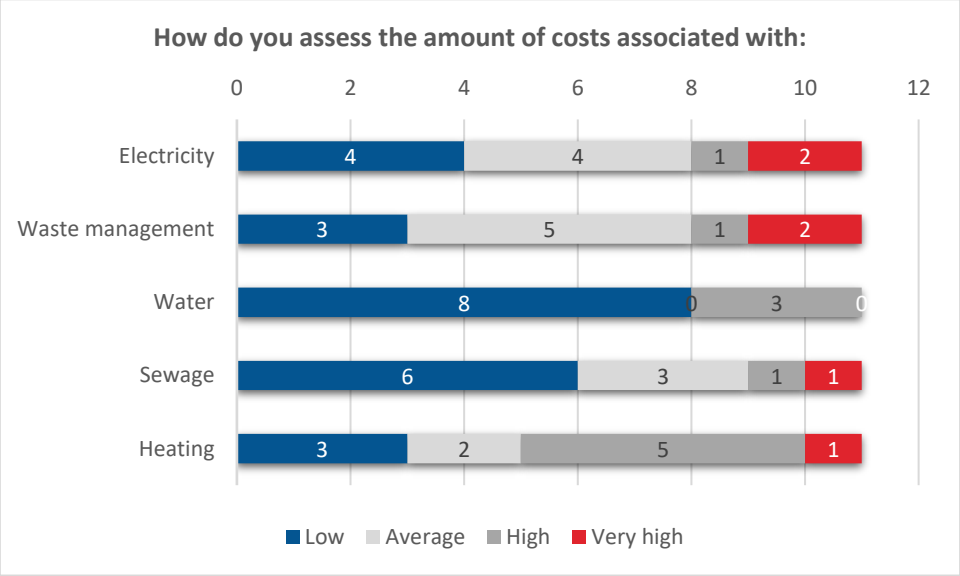
Figure 119: Main activity of the company - Hungary



Source: Own study based on the findings of the survey, n=11; n - number of companies surveyed

Entrepreneurs were asked to assess the amount of costs related to electricity, waste, water, sewage and heating in relation to the total cost of the company (Figure 120). Most answers indicated low or average costs. According to 8 companies, low fees are incurred in connection with water consumption. A different stance was taken with regard to heating - 5 companies said that heating costs were high and 1 company said that they were very high.

Figure 120: Costs incurred - Hungary



Source: Own study based on the findings of the survey, n=11; n - number of companies surveyed

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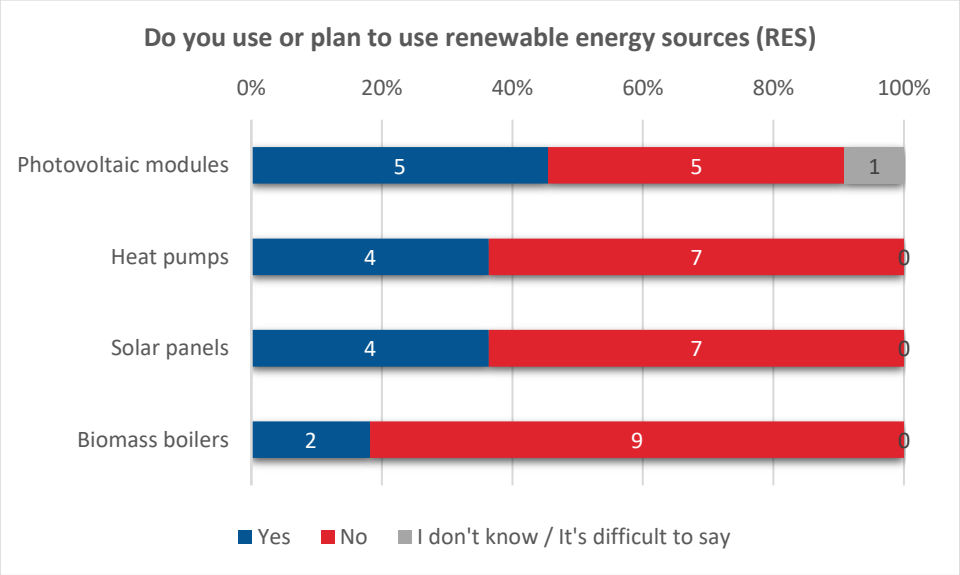
In response to the question about the use of renewable energy sources (RES) and their planned introduction in the future, the majority of entrepreneurs stated that RES are not and will not be used (Figure 121). The largest number of affirmative answers concerned photovoltaic modules, which 5 companies are interested in. Four companies each indicated heat pumps and solar collectors.

Figure 121: Use of renewable energy sources in companies - Hungary



Source: Own study based on the findings of the survey, n=11; n - number of companies surveyed

A filtering question was used in the research questionnaire in order to identify possible types of pollution produced by the surveyed companies, which subsequently allowed to identify areas requiring detailed analysis in terms of competence needs in environmental management. On this basis, companies that produce waste (8 companies), emit gases and dust into the air (2 companies) and use water and produce sewage (3 companies) were identified - Figure 122.

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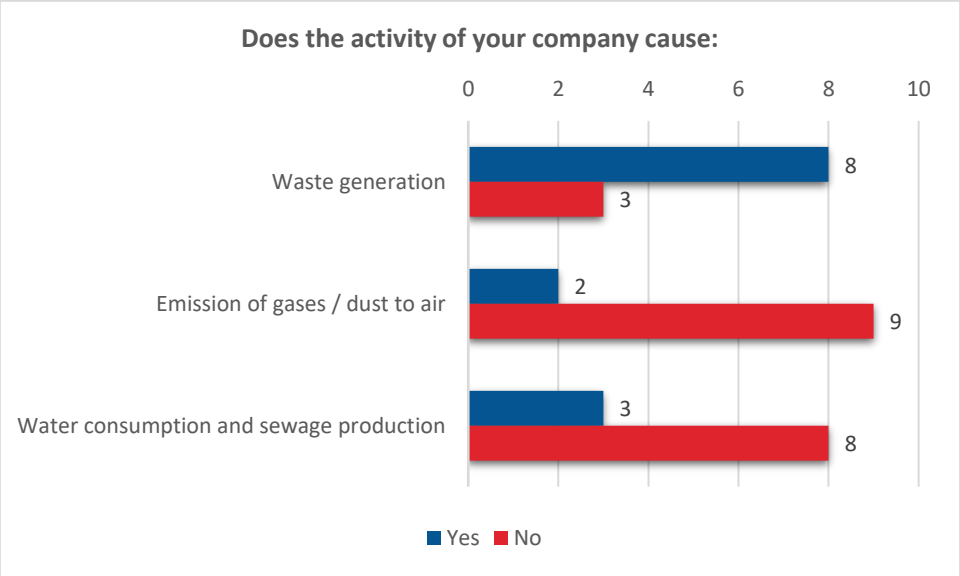
Figure 122: Types of pollution generated by companies in their business activity - Hungary



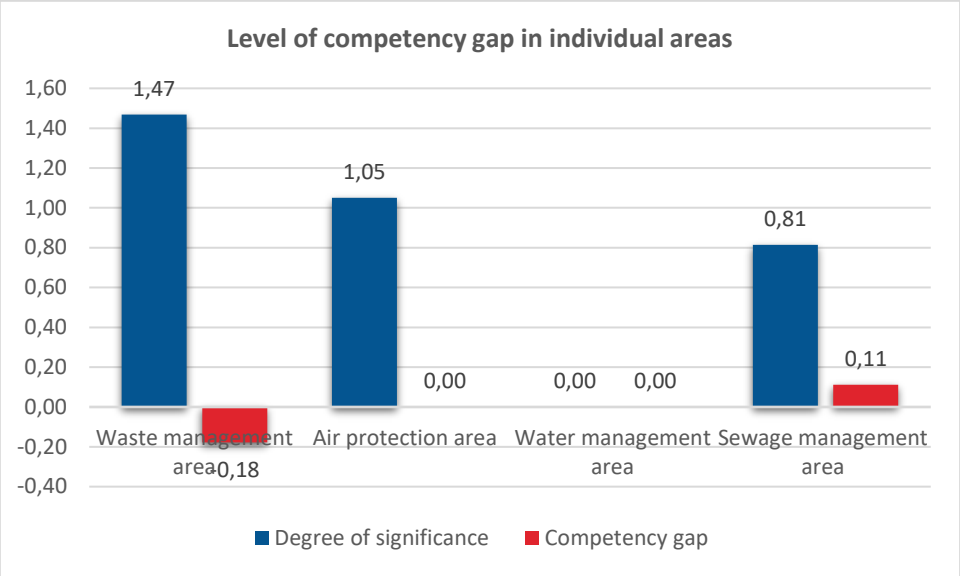
Source: Own study based on the findings of the survey, n=11; n - number of companies surveyed

Within the identified areas, the surveyed entrepreneurs were asked to assess the degree of significance of particular competences related to environmental economy from the point of view of the specificity of their company's operations, on a scale from 0 to 3 (where 0 means that a given competence does not concern their company, 1 - is not important, 2 - is important, 3 - is very important) and on a similar scale, to assess the current state of competences possessed by employees (where 0 means lack of competences, 1 - low competences, 2 - medium competences, 3 - very high competences).

The questions concerning competence needs in particular areas 1) waste, 2) emission of gases and dusts into the air, 3) water consumption and sewage production were answered only by those companies which declared that they use a given environmental aspect.

The competences in the area of waste management were the most significant, assessed at 1.47. It was also in this case that the competence shortages of employees turned out to be the greatest - at -0.18. The second most significant area was air protection (at 1.05), but in this case the value of the competence gap was assessed positively, which means that the knowledge of employees is, in the opinion of the respondents, slightly higher than the demand of enterprises. A similar situation applies to waste management. It is also worth noting the area of water management, where the significance reached the level of 0, similarly to the competence of employees. This may indicate the incompatibility of these competences with the needs and activities of companies. It is also worth noting that this area was assessed only by 3 companies which declared that they use water as part of their activities (Figure 123).

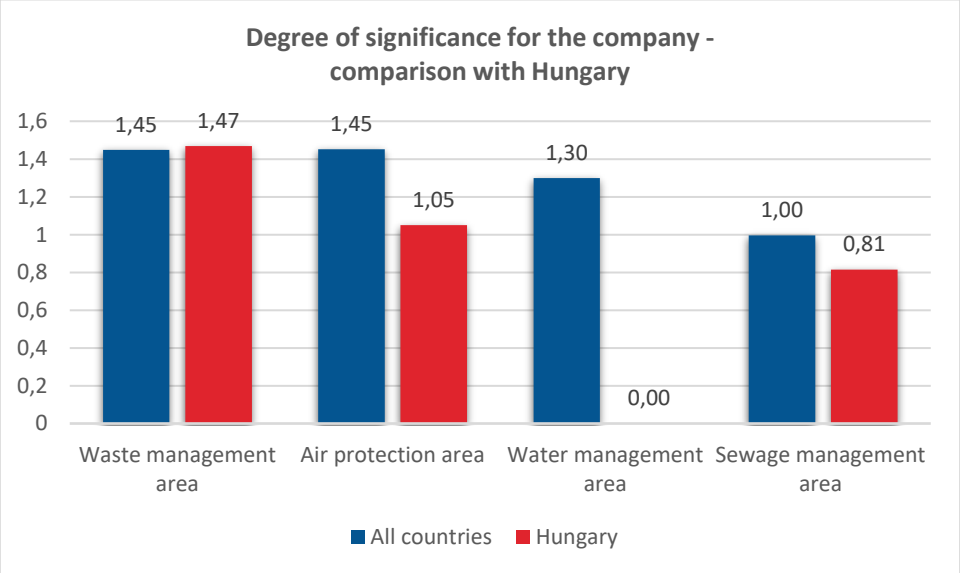
Figure 123: Level of competence gap in individual areas - Hungary



Source: Own study based on the findings of the survey, n=11; n - number of companies surveyed

In areas such as waste and wastewater management, the differences between Hungary and the aggregate results are rather small. A large disparity appears at the level of the water management area, where common results indicate a significance of 1.30 and 0.00 for Hungary. There is also a difference in air protection significance, with a significance level of 1.45 for the total average of all countries and 1.05 for companies from Hungary (Figure 124).

Figure 124: Level of relevance of competences - comparison with Hungary



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

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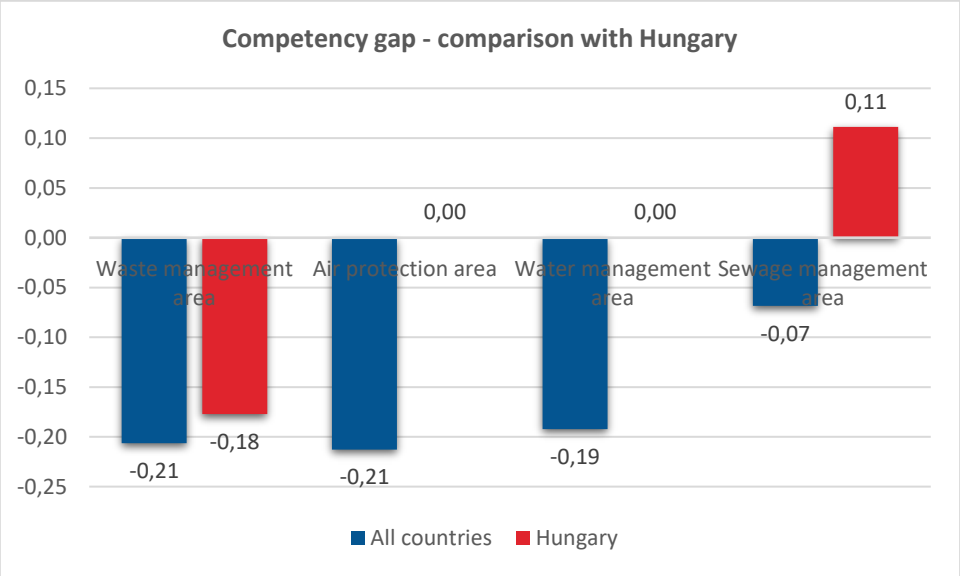
Performance discrepancies appear clearly at the level of competence gaps. In the area of air protection and water management there are no competence gaps for Hungary (level 0.00), while the overall results for all countries indicate negative gaps (gap at -0.21 in the area of air protection and gap at -0.19 in the area of water management). The answers of Hungarian entrepreneurs also indicated a positive gap related to wastewater management, which reached 0.11. In this area, the competence gap for all countries was at -0.07 (Figure 125).

Figure 125: Level of competence gap in individual areas - comparison with Hungary



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

9.1.1. Waste management area

In the most important and at the same time scarce area of waste management, several competences assessed by more than half of the surveyed Hungarian entrepreneurs can be distinguished as very important: Selection of the method of waste management (6 companies), Compliance with the rules of waste storage and disposal (5 companies), Selection of waste disposal methods (5 companies) - Figure 126.

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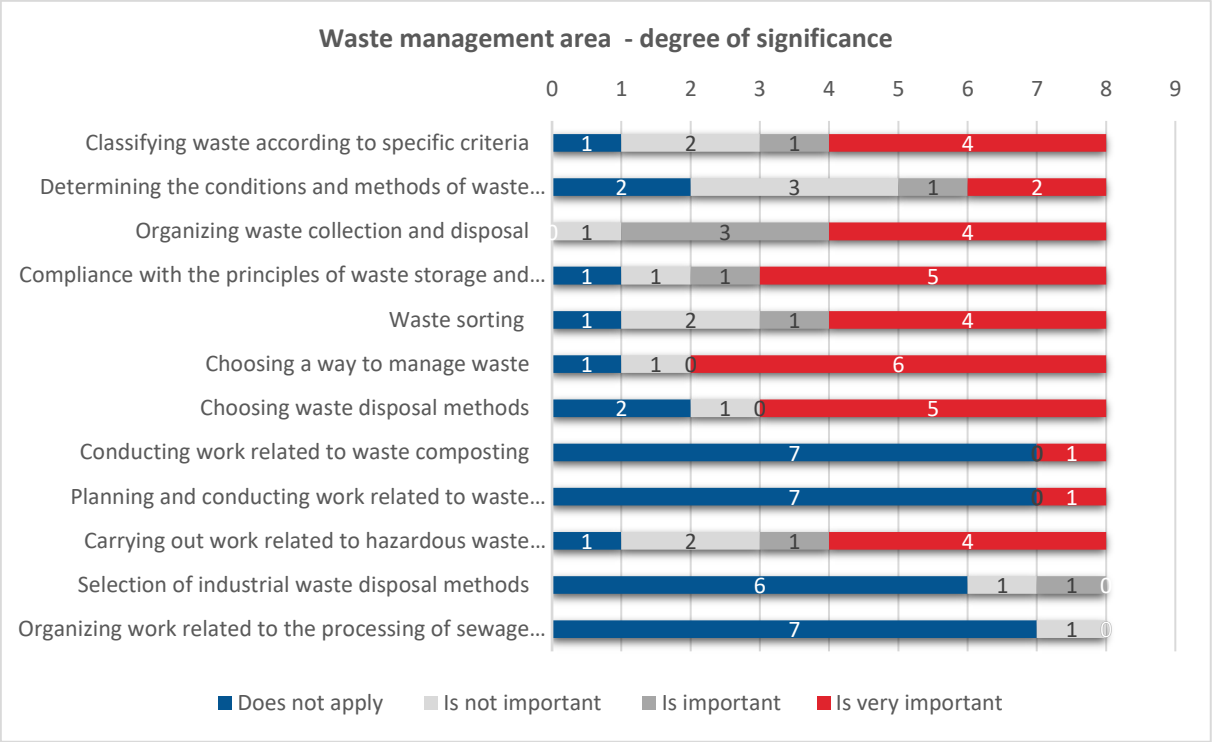
Figure 126: Level of relevance of waste management competences - Hungary



Source: Own study based on the findings of the survey, n=8; n - number of companies surveyed

In the area of waste management, the level of competence of the employees varies between the individual skills. High competences concern mainly Waste Sorting (5 companies) and Waste Management Selection (5 companies). Lack of skills is demonstrated by employees in connection with Planning and carrying out works related to waste incineration and operation of incineration plants, Carrying out works related to hazardous waste management, Organizing works related to sewage sludge treatment and equipment operation (Figure 127).

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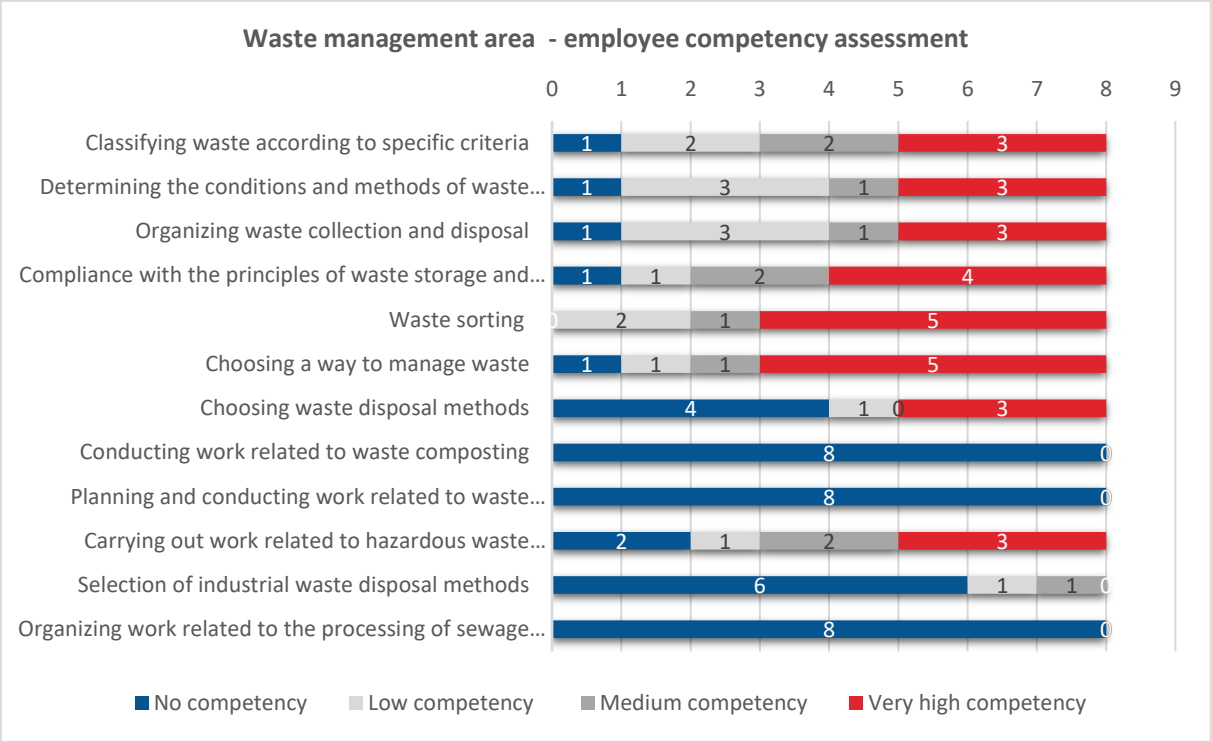
Figure 127: Level of competence of employees in the field of waste management - Hungary



Source: Own study based on the findings of the survey, n=8; n - number of companies surveyed

Table 26 presents detailed data on the level of competence gaps in relation to waste management skills. As indicated by the data contained in the table, the largest competence gaps, understood as the difference between the level of materiality of the competence and the actual skills possessed by the employees, are revealed in the Selection of waste disposal methods, Organization of waste collection and disposal.

Table 26: Specific competence gaps in waste management - Hungary

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Waste management area	**1,47**	**1,29**	**-0,18**
1	Classifying waste according to specific criteria	2,00	1,88	-0,13
2	Determining the conditions and methods of waste disposal	1,38	1,75	0,38
3	Organizing waste collection and disposal	2,38	1,75	**-0,63**
4	Compliance with the principles of waste storage and storage	2,25	2,13	-0,13

5	Waste sorting	2,00	2,38	0,38
6	Choosing a way to manage waste	2,38	2,25	-0,13
7	Choosing waste disposal methods	2,00	1,25	**-0,75**
8	Conducting work related to waste composting	0,38	0,00	-0,38
9	Planning and conducting work related to waste incineration and operation of incineration plants	0,38	0,00	-0,38
10	Carrying out work related to hazardous waste management	2,00	1,75	-0,25
11	Selection of industrial waste disposal methods	0,38	0,38	0,00
12	Organizing work related to the processing of sewage sludge and the operation of equipment	0,13	0,00	-0,13

Source: Own study based on the findings of the survey, n=8; n - number of companies surveyed

The biggest differences, which are revealed when comparing the overall results and the level of the competence gap determined on the basis of the opinions of Hungarian companies, are related to Determination of conditions and methods of waste disposal (gap at -0.26 - all countries, gap at 0.38 - Hungary) and Waste Sorting (gap at -0.12 - all countries, gap at 0.38 - Hungary) - Figure 128.

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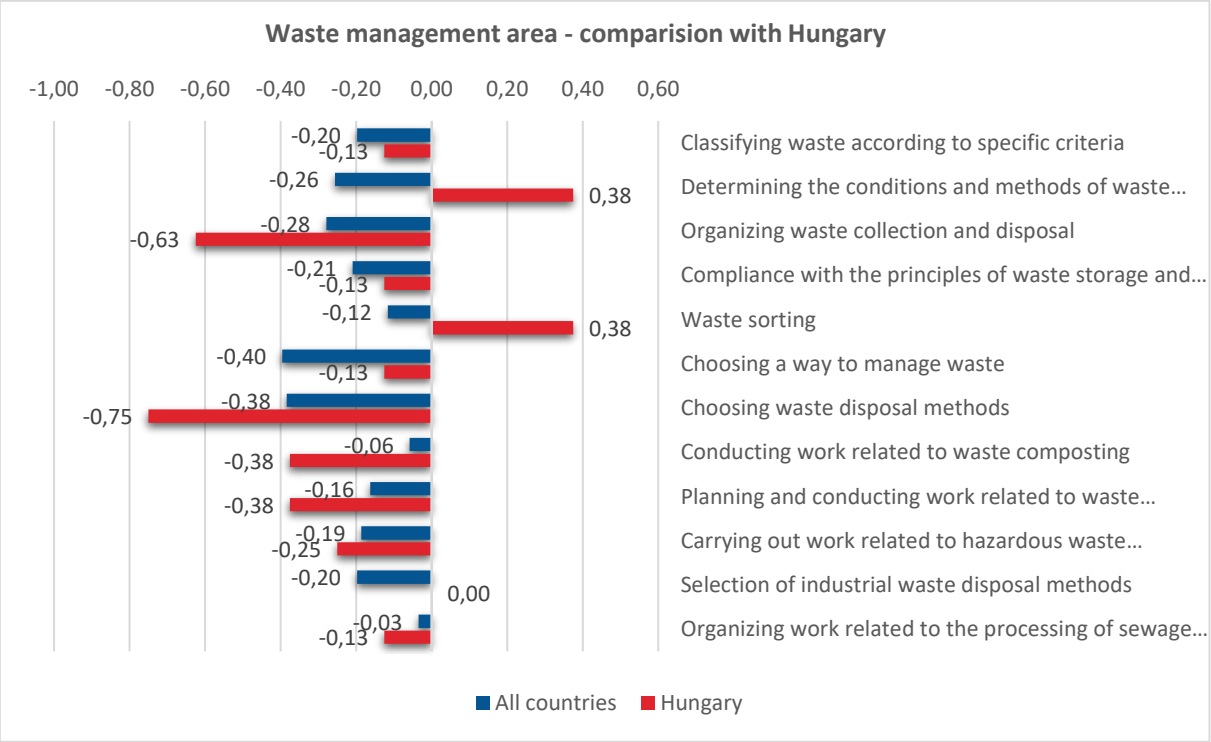
Figure 128: Specific competence gaps in waste management - comparison with Hungary



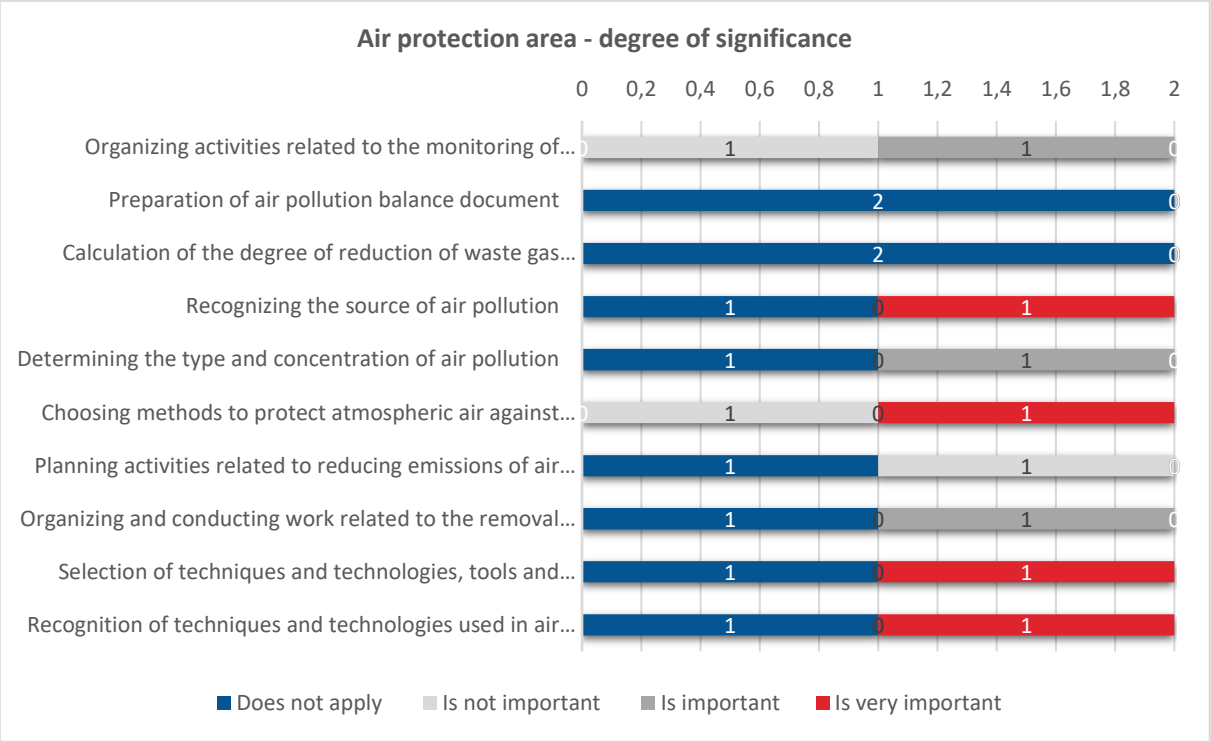
Source: Own study based on the findings of the survey, n=8; n - number of companies surveyed

9.1.2. The air protection area

Only 2 companies have commented on the area of air protection, which emit gases/dust into the air as part of their activities. The opinions of the companies on the importance of competence were divided. One answer indicating high significance was given to such competences as: Recognition of the source of air pollution, Selection of methods of air protection against pollution, Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed pollutants and process conditions, Recognition of techniques and technologies used in air protection (Figure 129).

Also after one answer saying about lack of significance appeared in relation to Organizing activities connected with monitoring of atmospheric air pollution, Selection of methods of protection of atmospheric air against pollution, Planning of activities connected with limiting emission of pollutants into the atmosphere.

Figure 129: Level of relevance of competences in the field of air protection - Hungary



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

Both entrepreneurs, when asked about the level of competence of their employees in the area of air protection, assessed the skills related to drawing up air pollution balances and calculating the degree of waste gas pollution reduction. One answer indicating very high competences was given: Recognition of the source of air pollution, Selection of methods of air protection against pollution, Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed pollutants and process conditions, Recognition of techniques and technologies used in air protection (Figure 130).

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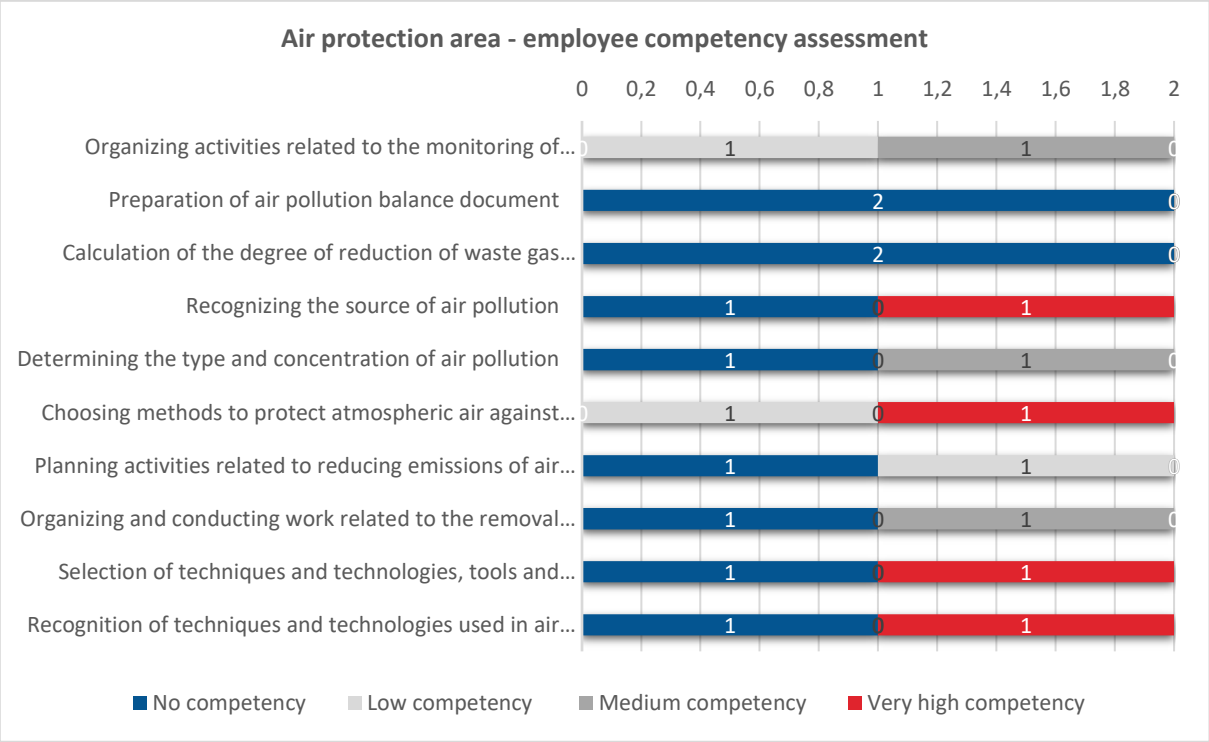
Figure 130: Employees' level of competence in the field of air protection - Hungary



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

Table 27 presents data on specific competence gaps in air protection skills. As the results in this area show, according to the two surveyed companies, there are no competence deficits - all gaps have reached the level of 0.00.

Table 27: Specific competence gaps in the field of air protection - Hungary

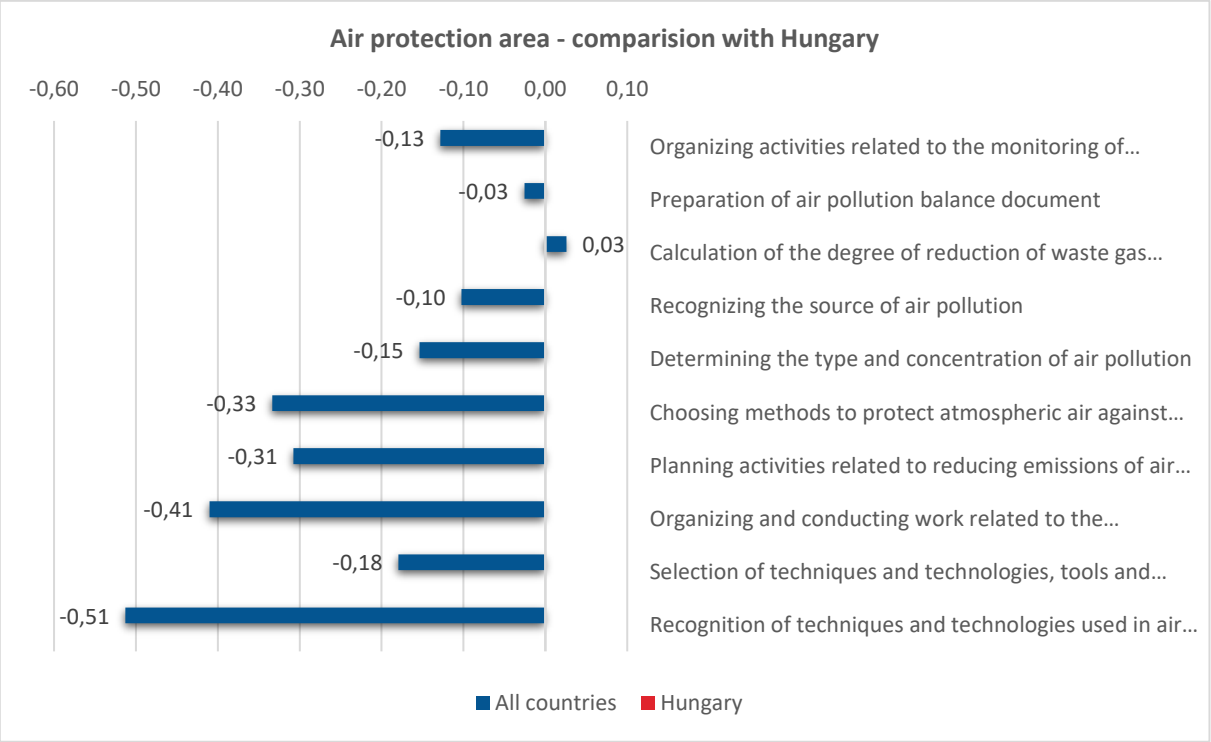
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Air protection area	**1,05**	**1,05**	**0,00**
1	Organizing activities related to the monitoring of atmospheric air pollution	1,50	1,50	0,00
2	Preparation of air pollution balance document	0,00	0,00	0,00
3	Calculation of the degree of reduction of waste gas impurities	0,00	0,00	0,00
4	Recognizing the source of air pollution	1,50	1,50	0,00

5	Determining the type and concentration of air pollution	1,00	1,00	0,00
6	Choosing methods to protect atmospheric air against pollution	2,00	2,00	0,00
7	Planning activities related to reducing emissions of air pollutants	0,50	0,50	0,00
8	Organizing and conducting work related to the removal of atmospheric pollution	1,00	1,00	0,00
9	Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions	1,50	1,50	0,00
10	Recognition of techniques and technologies used in air protection	1,50	1,50	0,00

Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In the case of Hungary, there were no competence gaps in the area of air protection. As a result, all of them were at the level of 0.00, significantly deviating from the aggregate values for all countries (Figure 131).

Figure 131: Specific competence gaps in the field of air protection - comparison with Hungary



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

9.1.3. Water management area

In the area of water management, all 3 companies that reported water consumption in connection with their activities stated that the indicated competences do not relate to their company's activities (Figure 132).

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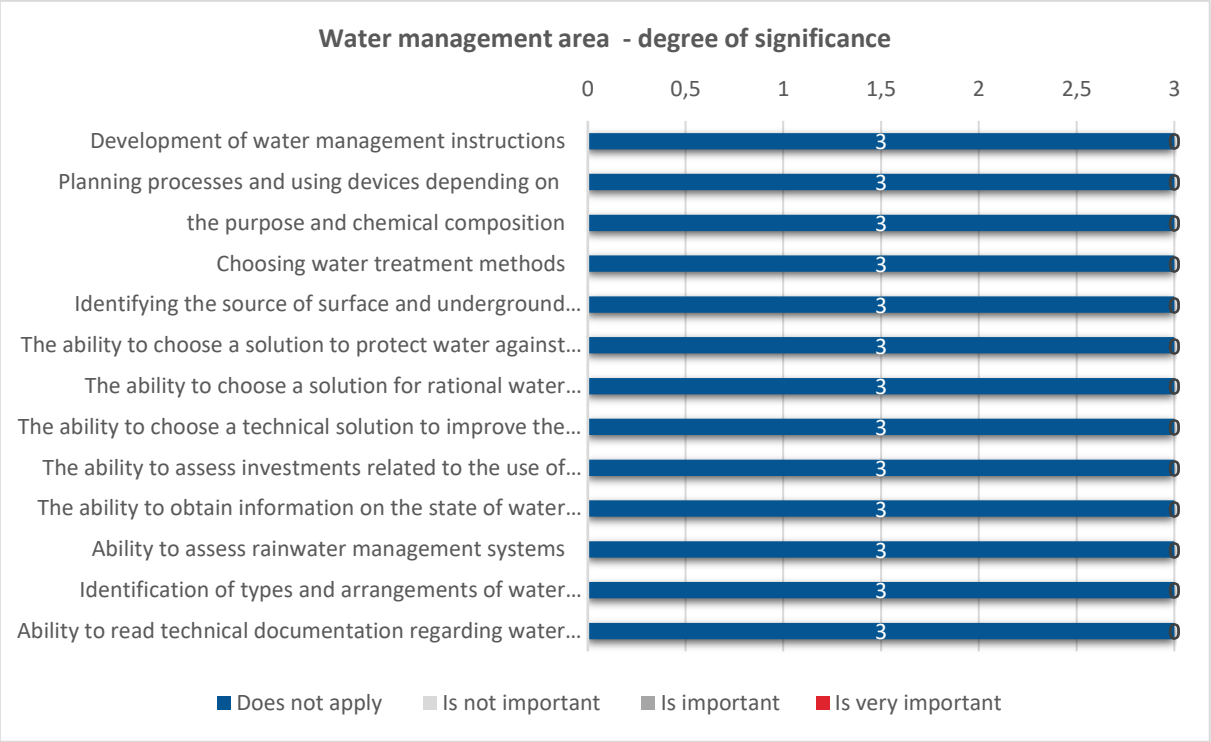
Figure 132: Level of relevance of competences in the field of water management - Hungary



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

Therefore, within all competencies, the lack of skills of employees was indicated, as shown in Figure 133.

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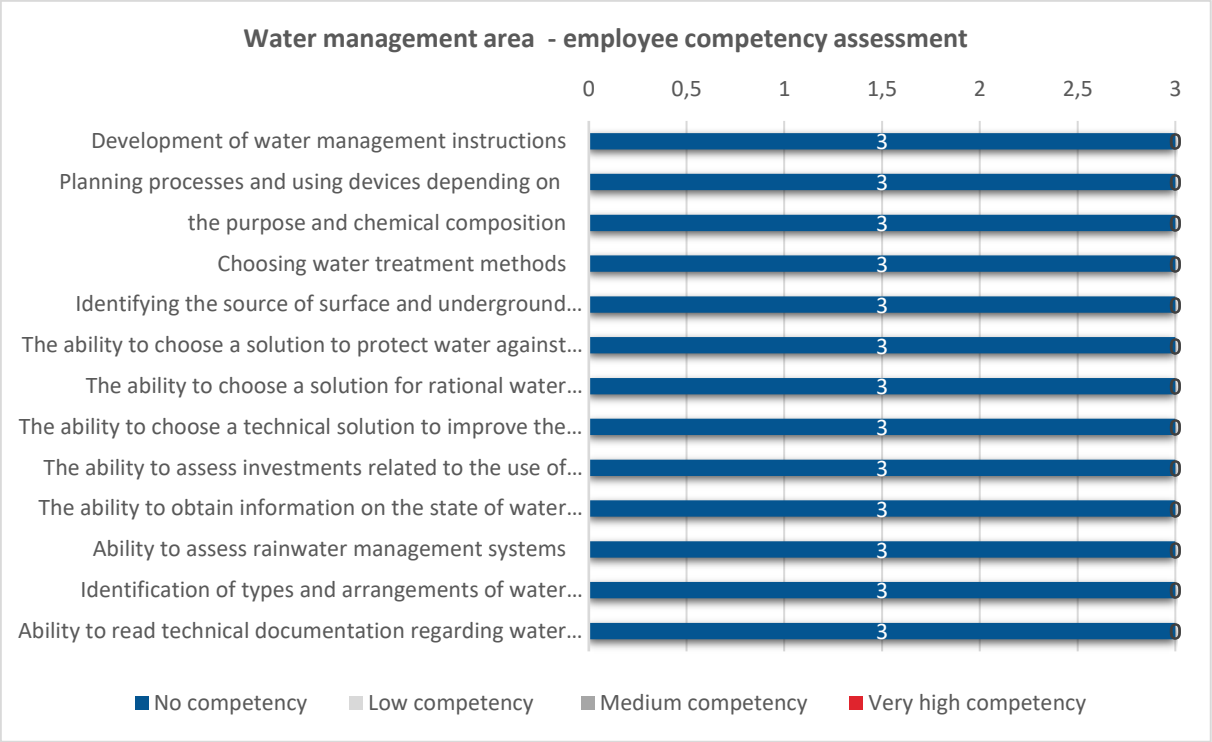
Figure 133: Level of competence of employees in the field of water management - Hungary



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

The lack of reference to competences and the skills deficits of the workforce make the competence gaps in all cases equal 0.00 (Table 28).

Table 28: Specific competence gaps in water management - Hungary

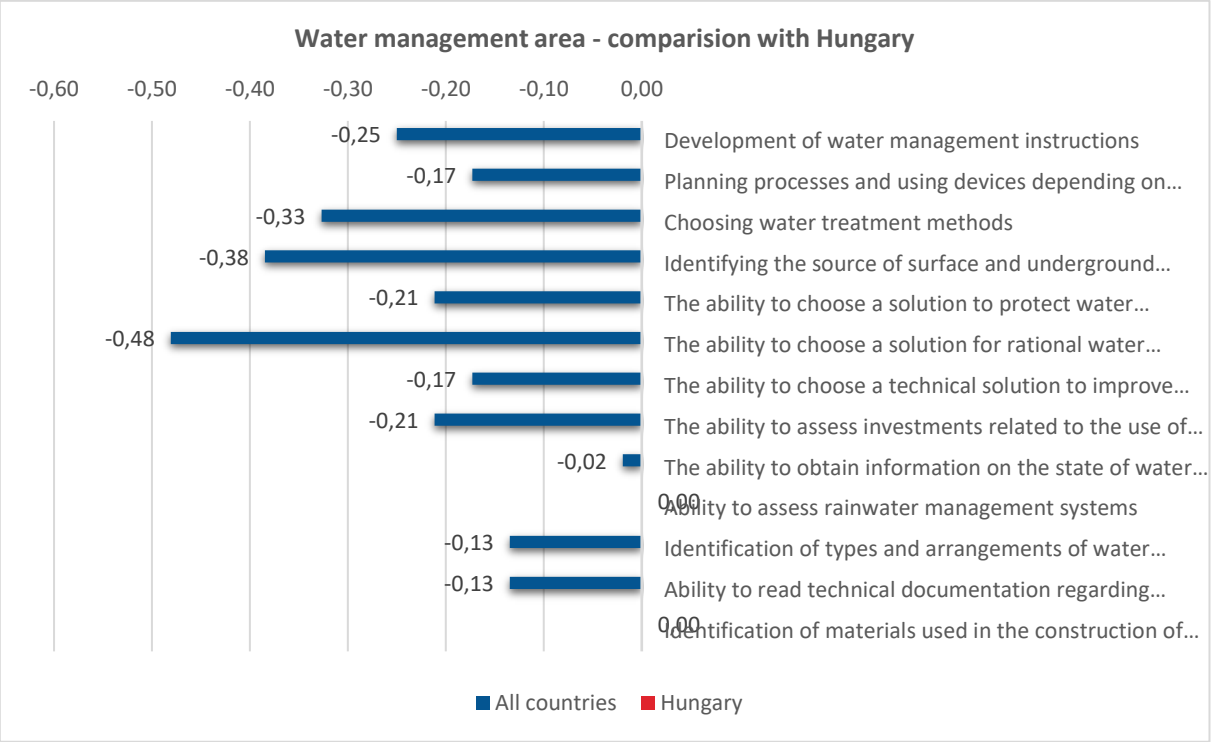
	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Water management area	**0,00**	**0,00**	**0,00**
1	Development of water management instructions	0,00	0,00	0,00
2	Planning processes and using devices depending on	0,00	0,00	0,00
3	the purpose and chemical composition	0,00	0,00	0,00
4	Choosing water treatment methods	0,00	0,00	0,00
5	Identifying the source of surface and underground water pollution	0,00	0,00	0,00

6	The ability to choose a solution to protect water against secondary pollution	0,00	0,00	0,00
7	The ability to choose a solution for rational water consumption	0,00	0,00	0,00
8	The ability to choose a technical solution to improve the quality of captured water	0,00	0,00	0,00
9	The ability to assess investments related to the use of groundwater resources	0,00	0,00	0,00
10	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes	0,00	0,00	0,00
11	Ability to assess rainwater management systems	0,00	0,00	0,00
12	Identification of types and arrangements of water supply networks on the company's premises	0,00	0,00	0,00
13	Ability to read technical documentation regarding water management	0,00	0,00	0,00

Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

There are no competence gaps in the area of water management in Hungary. As a result, all deficits were at the level of 0.00, significantly deviating from the aggregate values for all countries (Figure 134).

Figure 134: Specific competence gaps in water management - comparison with Hungary



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

9.1.4. Sewage management area

All competences concerning wastewater management were considered by at least 2 out of 3 surveyed companies as not related to the activities of the company. In the case of part of competence 1, the company indicated their high significance, these were: Ability to use technical documentation related to sewage management, Ability to assess the quantity and quality of sewage sludge generated, selection of equipment for its processing, Conducting works related to management and disposal of sewage sludge, Selecting equipment for treatment of various types of sewage, Analysing processes occurring during sewage treatment, Classification of sewage according to specific criteria, Ability to apply for water-law permits (Figure 135).

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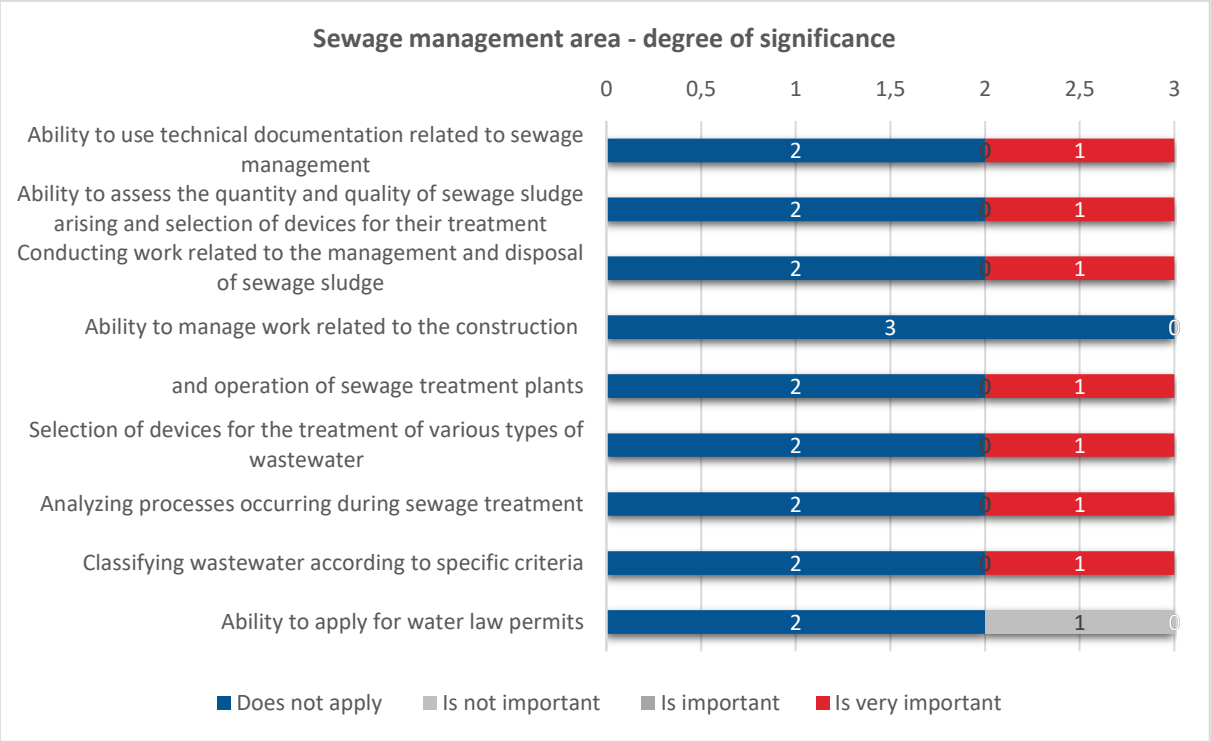
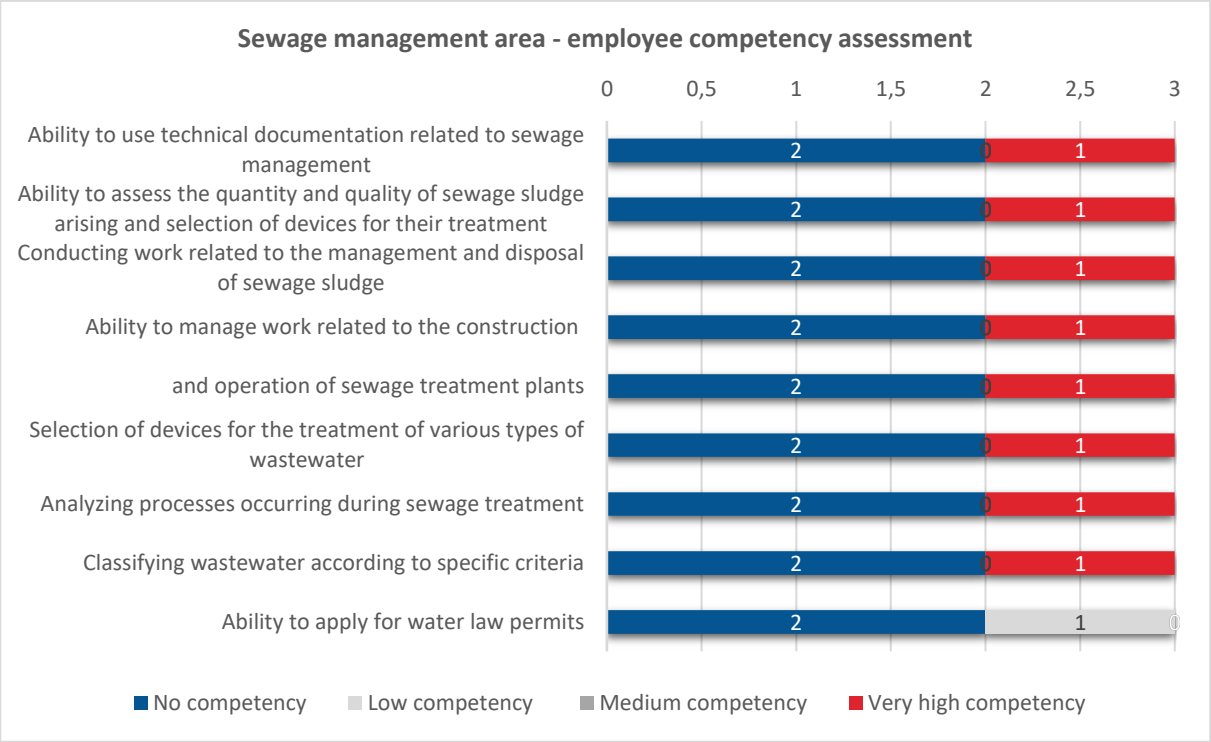
Figure 135: Level of relevance of competences in the field of wastewater management - Hungary



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

In the case of all listed sewage management skills, 2 respondents indicated that employees lack competence in this area (Figure 96). 1 company highly valued the competence of employees related to the Ability to use technical documentation related to sewage management, Ability to assess the quantity and quality of sewage sludge generated, Selection of equipment for sewage sludge treatment, Conducting works related to the management and disposal of sewage sludge, Ability to manage works related to the construction and operation of sewage treatment plants, Selection of equipment for treatment of various types of sewage, Analysis of processes occurring during sewage treatment, Classification of sewage according to specific criteria, Ability to apply for water-law permits (Figure 136).

Figure 136: Employees' level of competence in the field of wastewater management - Hungary



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

In the area of sewage management, there were no negative competence gaps - most of them reached the level of 0.00. Only one gap, concerning the Ability to manage works related to construction and operation of sewage treatment plants, was at a positive level of 1.00, which means that the competence of employees in this area is higher than employers' expectations (Table 29).

Table 29: Specific competence gaps in sewage management - Hungary

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Sewage management area	**0,81**	**0,93**	**0,11**
1	Ability to use technical documentation related to sewage management	1,00	1,00	0,00
2	Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment	1,00	1,00	0,00
3	Conducting work related to the management and disposal of sewage sludge	1,00	1,00	0,00

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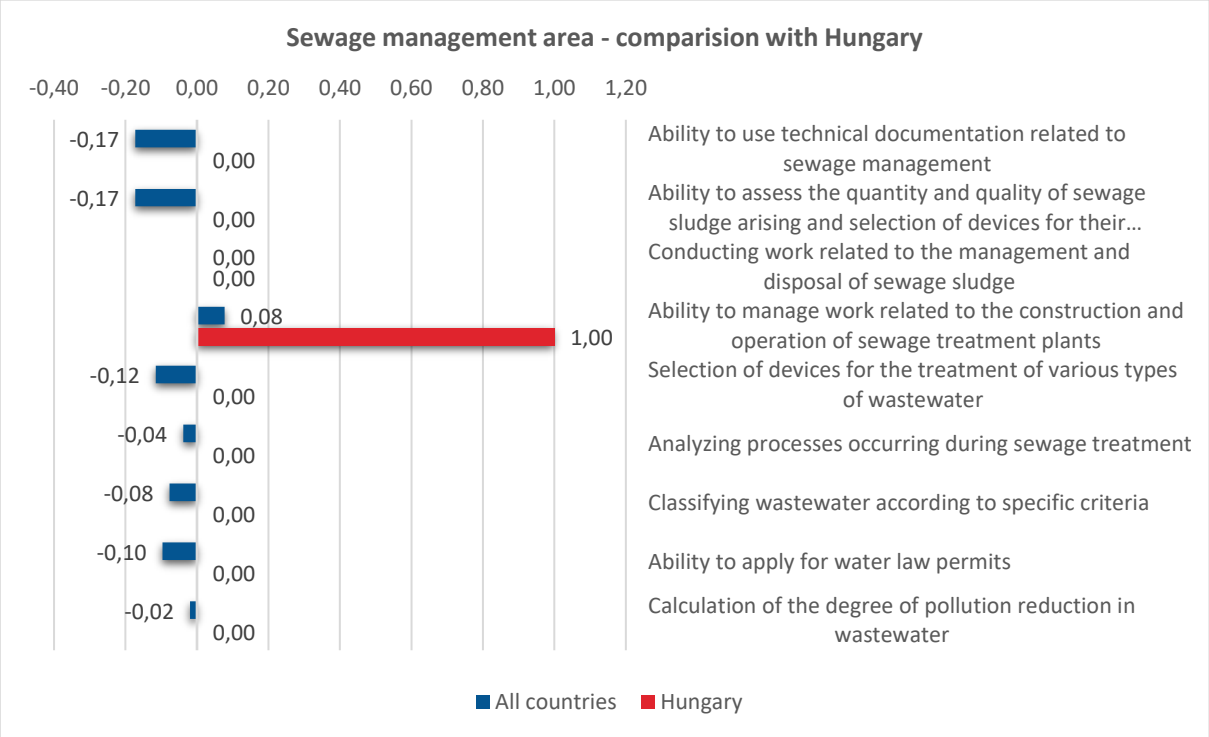
4	Ability to manage work related to the construction	0,00	1,00	1,00
5	and operation of sewage treatment plants	1,00	1,00	0,00
6	Selection of devices for the treatment of various types of wastewater	1,00	1,00	0,00
7	Analyzing processes occurring during sewage treatment	1,00	1,00	0,00
8	Classifying wastewater according to specific criteria	1,00	1,00	0,00
9	Ability to apply for water law permits	0,33	0,33	0,00

Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

Almost all competences in the area of wastewater management have been recognised by Hungarian entrepreneurs as free of competence deficits (Figure 137). The only gap concerning Hungary was on a positive level and concerned the ability to manage the construction and operation of sewage treatment plants (competence gap at 0.08 - all countries, competence gap at 1.00 - Poland).

Figure 137: Specific competence gaps in sewage management - comparison with Hungary



Source: Own study based on the findings of the survey, n=3; n - number of companies surveyed

9.2. Experts' opinions on environmental management needs

No expert interviews were conducted on the needs of environmental management in Hungary.

9.3. Examples of good practice in environmental management

The last stage of the conducted analyses was desk research, i.e. study of existing data, which consisted in the analysis of texts and materials available on the Internet describing examples of good practices in green education implemented in the country. Descriptions of examples of good practices implemented in Hungary are presented below.

Eco-schools - Education for sustainable development[42]

Eco-school is a flexible programme developed by the Hungarian Institute for Educational Research and Development (HIERD) which was implemented in 2000 in 40 pilot schools. With a holistic approach (involving the whole school), it establishes the principles of sustainable development in a practical manner, also through study subjects. Hungary is facing particular environmental challenges. Currently the focus is poor air quality, although the problem is more common in rural areas than in cities, as people use wood and rubbish to heat their homes. The Eco-school programme engages educational establishments in environmental matters through the school work plan. The programme has been introduced in one in four Hungarian schools. More precisely, by the end of 2017 the title of Eco-school was awarded to 1134 schools, reaching 350,012 students and 34,890 teachers.

Schools apply to the programme on a voluntary basis and work to gain the Eco-school title through comprehensive and detailed assessment of the school environment and pedagogy. The programme provides a flexible framework and grading system for schools which, most certainly, differ based on the context. Rural schools may receive points for creating a school garden, while a city school may get points for water conservation techniques. Every school has to present an annual action plan, which are continuously evaluated. Children are involved from the very beginning as they decide what the focus of their studies is, and through the development of the student council, which is responsible for part of the school's self assessment. At the staff level, every employee of the schools is involved in the development of the school's vision. In teacher training, educational aids and training courses support student involvement in creating experience-based educational environments. Student activities include excursions, environmental projects, and exhibitions for the local community, schools patrols where students verify and collect information on energy consumption, and green local parliaments which involve students in making real decisions with municipal authorities. The programme also goes beyond school walls. From 2015 the Eco-school programme criteria include community services which provide teenagers with the opportunity to transform their communities. The programme's success enabled the expansion of the project to Green Kindergartens Programme, as well as reaching higher education and teacher training.

[42] https://en.unesco.org/news/students-take-lead-spread-eco-schools-initiative-hungary, [access: 05.03.2020]

Activities for younger children include forest kindergartens, where the children get to spend several days outdoors learning about plants and animals. It also includes environmentally friendly participation in local customs holiday customs like Christmas by making green presents, which is also an important way of introducing sustainability principles in children's development. While the programme is undeniably successful, there is still a lot of work to do. The longterm goal is reaching every school in Hungary. Most importantly, it is important to continue working on shifting the mindset of young people from pessimism to optimism. We tell them that "the future is not decided, it is up to us."

Adventure Energy[43] (Energiakaland)

Energy Adventure is a large-scale educational programme focused on supporting teachers in the development of energy awareness, understood as improving their knowledge and competence in terms of energy. The programme has been developed in line with the principles of unified science teaching. "Energy is precious, energy is interesting" - this is the motto of the programme and its educational portal: www.energiakaland.hu, where young people can interactively learn about energy issues in a manner adjusted to their school programme. The "Energy Portal" enables accessible and fun education for 4 age groups (6-18 years), providing knowledge and conditions for conscious ecological thought. Experts from the energy sector and education develop the Adventure Energy Portal in Hungary based on international experience. The portal features numerous components, including:

- Energy Hack - for preschool teachers and heads, parents, in order to increase the interest and curiosity of preschoolers in energy-oriented phenomena (at home and in preschool), creating a basis for perceiving energy as a valuable resource.
- Energy Home - for students aged 6-10 and comprises in two parts: online exercises and classroom instruction package, with 5 colorful knowledge carts and 11 worksheets, which are free to copy if necessary.
- Energy City - for children aged 7-11, consists of two parts: online classes and school packages with 14 copyable information cards and 10 free exercise sheets.
- Energy Nation - for students aged 11-15. The website also provides additional information on integrating the programme with curricula and other out of school education programmes. Supporting the development of social and civic competences, the programme contributes to the improvement of digital literacy and communication.
- Energy World - devoted to students aged 14 to 18, who are involved in vocational training and/or are students of vocational schools. The programme also supports citizenship educations. It is also useful for students who want to learn the core skills in IT and communication. The programme may be integrated with local curricula, specializations and other extracurricular programmes, and teachers can get

[43] Néder K., Saly E., Szentpétery L., Hazai és nemzetközi környezeti nevelési programok, projektek a közelmúltban,http://ofi.hu/sites/default/files/ofipast/2013/06/Hazai_es_nemzetkozi_KN__tanulmany_vegleges.pdf, [access: 05.03.2020] s. 29

methodological guidance from the website. Covered topics include: learning about different energy sources; their advantages and disadvantages; energy production prospects; local, national, and global effects of energy-related decisions; energy pathways from source to target; core principles of energy security; global energy conservation principles; household energy management.

The programme allows students to make virtual decisions using interactive materials and learning about their consequences. Students become actively aware about the energy-related aspects of their environment and contribute to conscious energy transformation.

Waste Academy[44]

Waste academy is an active education and communication platform run in the spirit of ecological awareness with its permanent exhibition as the central point. The platform includes numerous educational materials and films. The purpose of the academy is to present the threats of the 21st cenury and prevent them by indicating best practices for solving similar issues from several locations. It is based on the waste pyramid which presents visual and practical facts on modern waste management, as well as practical stems for promoting ecological awareness. The Academy presents milestones in waste history and then, thanks to short-term solutions at the bottom of the pyramid (landfills, energy recover) visitors are introduced to the world of the most environmentally friendly solutions (recycling, waste prevention). At the same time, games, intricate installations and infographics facilitate the transmit of information. The academy is mainly concentrated on PREVENTION, as this is the best way of reducing the amount of waste! This is how a diverse, every-day and friendly action environment may be promoted, from conscious consumer practices through composting. At registration, visitors get a free guided tour. The ÖKO-PACK LTD. organisation developed also an educational and teaching aid methodology in line with environmental policy, thanks to which visitors learn about the most important concepts and practices of environmental protection, recycling, conscious shopping, and composting over a 35-40 minute guided tour. However, the Academy is not only the exhibition, but it is also an intricate ecological education platform. The information presented there are enhanced with educational materials, short films, and many more! Waste Academy teaches to thing about every purchased product. Its message is contained in these statements: By paying, we support the manufacturer of the product, the use of resources, and the production of packaging! Hence, in many cases we indirectly support deforestation, inhuman treatment, and even animal testing. That is why it is so important to become CONSUMERS who are conscious of their actions and their impact on the environment.

Save@work[45] - promoting sustainable work, life and consumption patterns

The mission of GreenDependent Institute is to “research, develop, and promote sustainable lifestyle and consumption patterns”. The concept used here is “greening”, which means balancing private and professional life through implementing climate friendly principles in every day practices. The institutes supports the

[44] http://www.okopack.hu/hu/hulladek-akademia, [access: 05.03.2020]
[45] http://intezet.greendependent.org/en/node/298, [access: 05.03.2020]

implementation of "*green office*" principles, for instance in the Save@Work[46] project, which includes the implementation of efficiency principles in offices, sustainable transportation as well as programmes and events. The assumption of the Institutes is that any new machinery, product or device is purchased only when there is an evident need. Offices are quipped eco-labelled telephones, laptops and monitors. If any new product is purchased, it has the "A" energy efficiency class. Energy saving mode is used whenever possible. Also, offices have plants which eliminate air pollutants. These kinds of practices are disseminated - a significant set of examples of implemented actions can be found at the GreenDependent website, along with examples of interesting initiatives for businesses, households, and local communities. Environmentally friendly solutions are largely promoted also among (and through) volunteers who frequently want to change their surrounding natural environment for the better. The instutute is also involved in research thorugh its participation in the pan-European ENERGISE project, aimed at providing a better understanding of social and cultural influences on energy consumption. The project is financed under EU Horizon 2020 over a period of 3 years (2016-2019). ENERGISE establishes, tests, and evaluates a bottom-up approach to energy transformation across European homes and communities. According to the authors of the project (a partnership of organisations and universities from 7 countries) cultural factors are crucial in using (or not using) environmentally friendly solutions and developing awareness with the use of "Living Labs".

[46] https://www.saveatwork.eu/

BFKK

competencies to work

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Water, Waste & Circular Economy

report

summary

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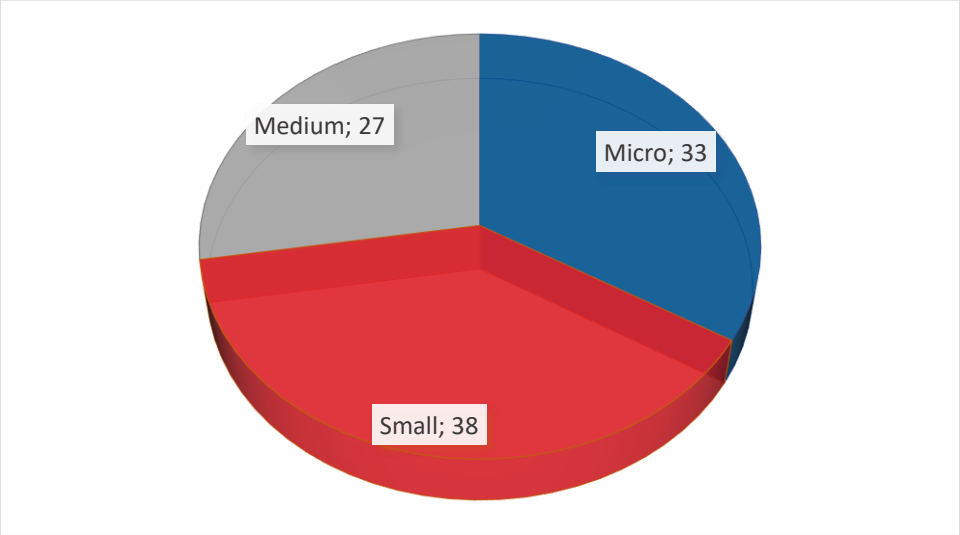
10. Summary - comparative analysis

10.1. Results of quantitative studies on environmental management needs

A total of 99 companies operating in Austria, Finland, Germany, Lithuania, Hungary, Norway and Poland took part in the survey. The largest number of them, 38 of which were small enterprises, 33 belonged to the category of microenterprises and the remaining 27 were small enterprises (Figure 138).

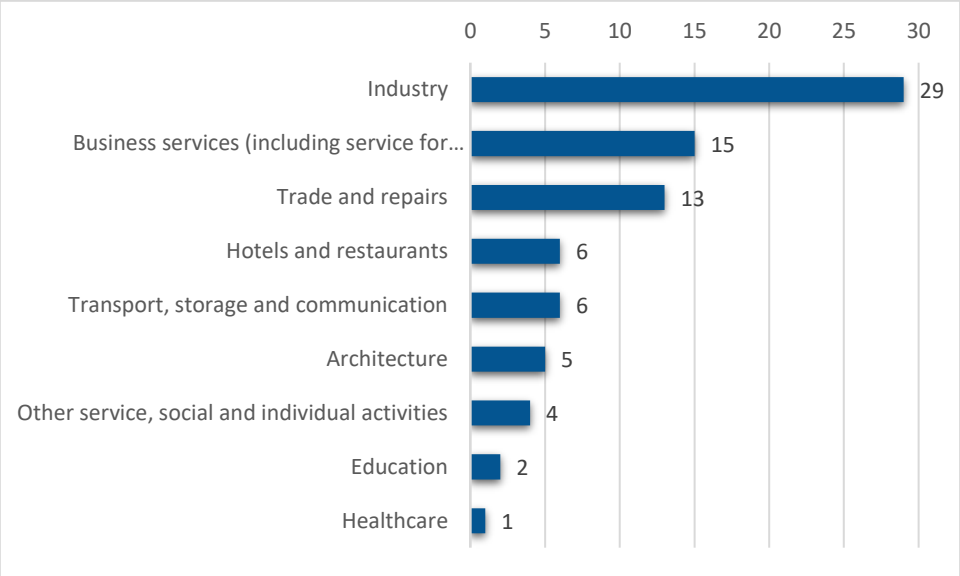
Figure 138: Company size – all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

The largest number of enterprises subject to analysis operates in industry (29 companies), the remaining ones belong to the industry related to company services (including services for companies), real estate (15 companies), trade and repair (13 companies), hotel and catering (6 companies), transport, warehouse management and communications (6 companies), construction (5 companies), service, social and individual activities (4 companies), education (1 company) and health care (1 company) - Figure 139.

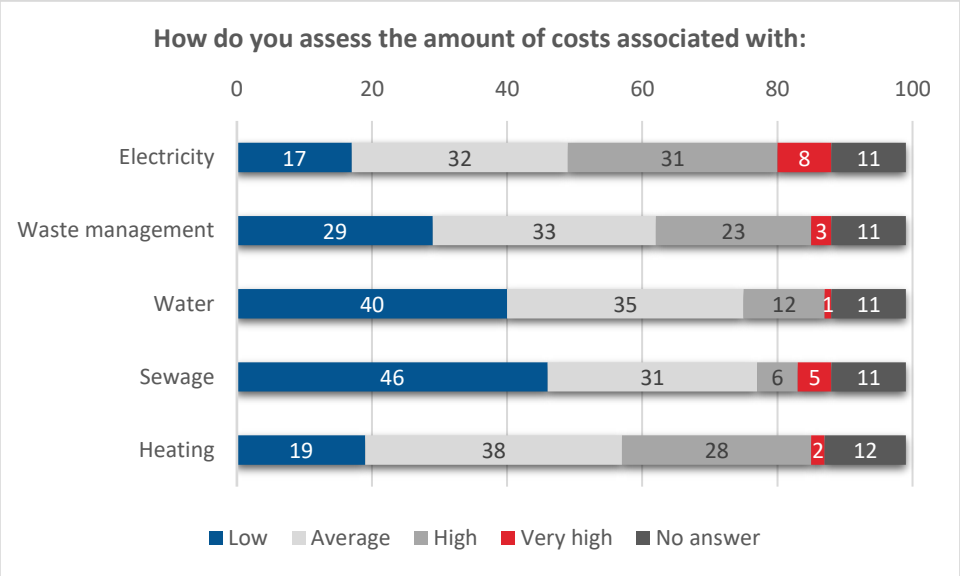
Figure 139: Main activity of the company – all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

Entrepreneurs were asked to assess the amount of costs related to electricity, waste, water, sewage and heating in relation to the total cost of the company (Figure 140). For all areas, the answers indicated rather low or average costs incurred in relation to the use of the discussed environmental aspects. This was particularly true for wastewater generation (46 answers indicated low costs, 31 answers indicated medium) and water consumption (40 answers - low, 35 answers - medium). The highest number of responses indicating high (31 companies) or very high (8 companies) costs related to electricity.

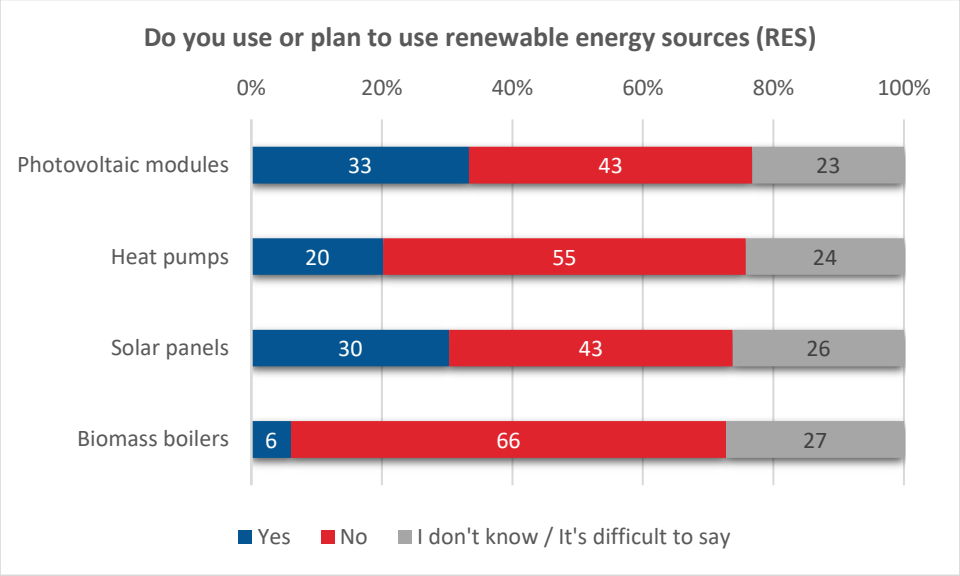
Figure 140: Costs incurred – all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

In response to the question about the use of renewable energy sources (RES) and their planned introduction in the future, the majority of entrepreneurs stated that biomass boilers are not and will not be used (66 answers). The 55 surveyed entrepreneurs are also not interested in heat pumps. On the other hand, the most interested are photovoltaic modules (33 companies) and solar collectors (30 companies) - Figure 141.

Figure 141: Use of renewable energy sources in companies – all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

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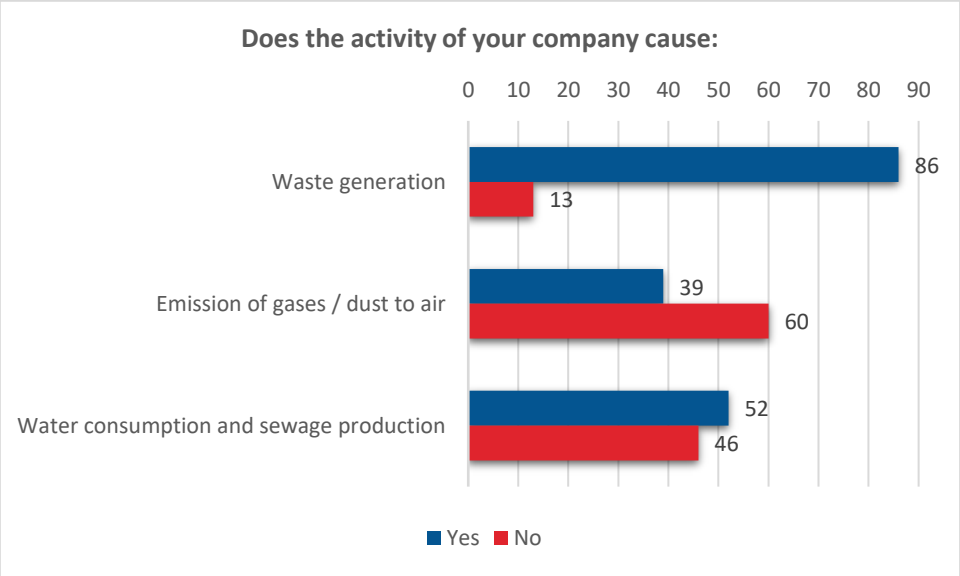
A filtering question was used in the research questionnaire in order to identify possible types of pollution produced by the surveyed companies, which subsequently allowed to identify areas requiring detailed analysis in terms of competence needs in environmental management. On this basis, companies that produce waste (86 surveyed companies), emit gases and dust into the air (39 companies), and use water and produce sewage (52 companies) were identified - Figure 142.

Figure 142: Types of pollution generated by companies in their business activity – all countries



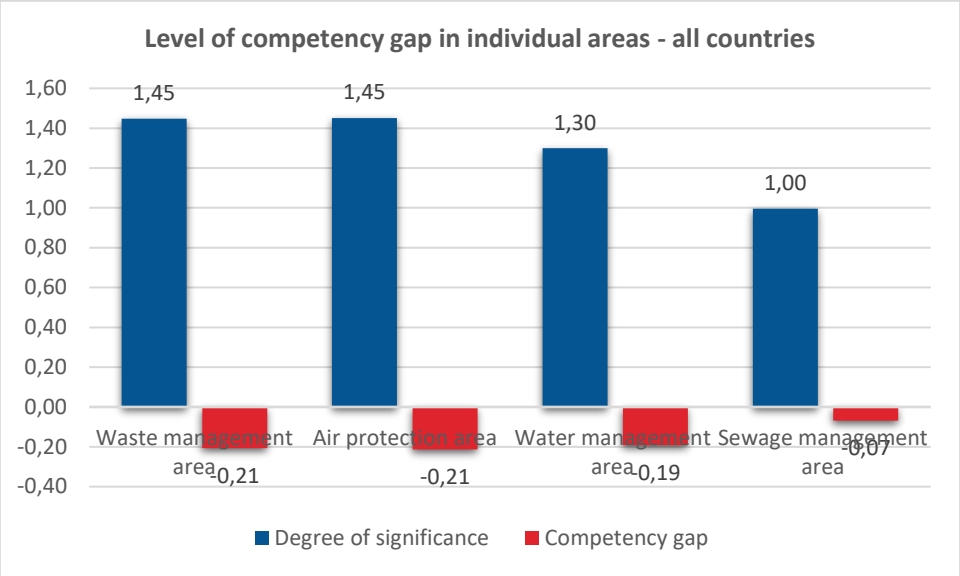
Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

Within the identified areas, the surveyed entrepreneurs were asked to assess the degree of significance of particular competences related to environmental economy from the point of view of the specificity of their company's operations, on a scale from 0 to 3 (where 0 means that a given competence does not concern their company, 1 - is not important, 2 - is important, 3 - is very important) and on a similar scale, to assess the current state of competences possessed by employees (where 0 means lack of competences, 1 - low competences, 2 - medium competences, 3 - very high competences).

The questions concerning competence needs in particular areas 1) waste, 2) emission of gases and dusts into the air, 3) water consumption and sewage production were answered only by those companies which declared that they use a given environmental aspect.

Entrepreneurs considered that the areas of greatest significance were waste management and air protection, whose significance reached 1.45 (Figure 143). The second most important area was water management (at 1.30). Slightly lower significance was attributed to sewage management (at 1.00). The greatest competence shortages of employees were recorded in the area of waste management and air protection - the gap was at -0.21.

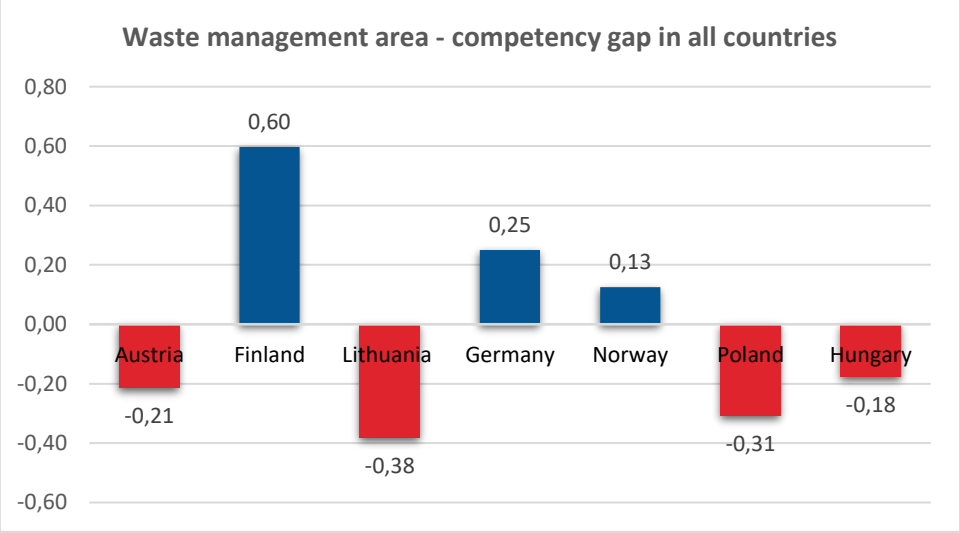
Figure 143: Level of competence gap in individual areas – all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

Figure 144 compares the competence gaps in waste management in all countries participating in the survey. Finland clearly stood out, with the competence gap reaching a positive level: 0.60. According to Finnish entrepreneurs, the level of competence of employees is higher than the demand of companies. Gaps at the positive level also appeared in Germany (gap at 0.25) and Norway (gap at 0.13). The largest competence deficits were recorded in Lithuania, where the competence gap was at the level of -0.38.

Figure 144: Level of competence gap in waste management area - comparison of all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

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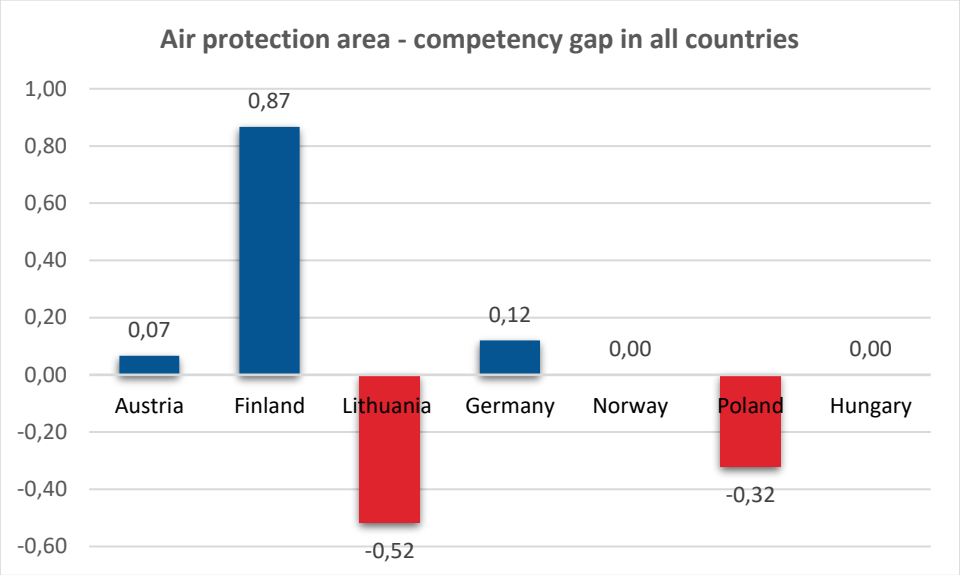
In the area of air protection, the largest competence gap is in Lithuania, where it was at the level of -0.52. Slightly smaller deficits were indicated by Polish entrepreneurs, who assessed them at the level of -0.32. The best competence of employees was assessed by the companies surveyed in Finland - the competence gap was at the positive level of 0.87 (Figure 145).

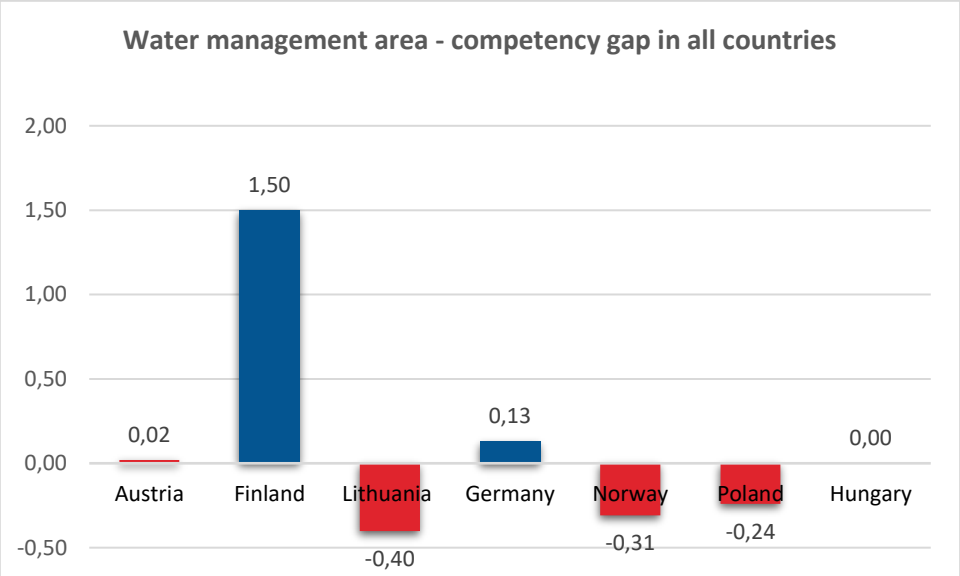
Figure 145: Level of competence gap in air protection area - comparison of all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

Finland indicated high competence of workers also with regard to water management, where the competence gap was at 1.50 (Figure 146). The largest competence gaps were reported by entrepreneurs from Lithuania (competence gap at -0.40) and Norway (competence gap at -0.31).

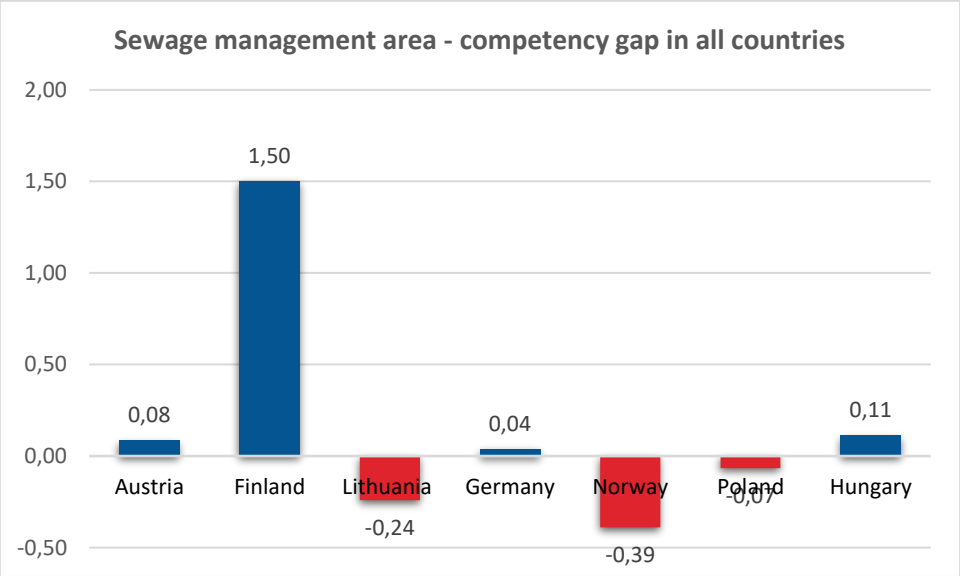
Figure 146: Level of competence gap in water management area - comparison of all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

In the area of sewage management, Norway has the highest skills gap with -0.39. In Finland, employee skills were again rated high, at 1.50 (Figure 147).

Figure 147: Level of competence gap in sewage management area - comparison of all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

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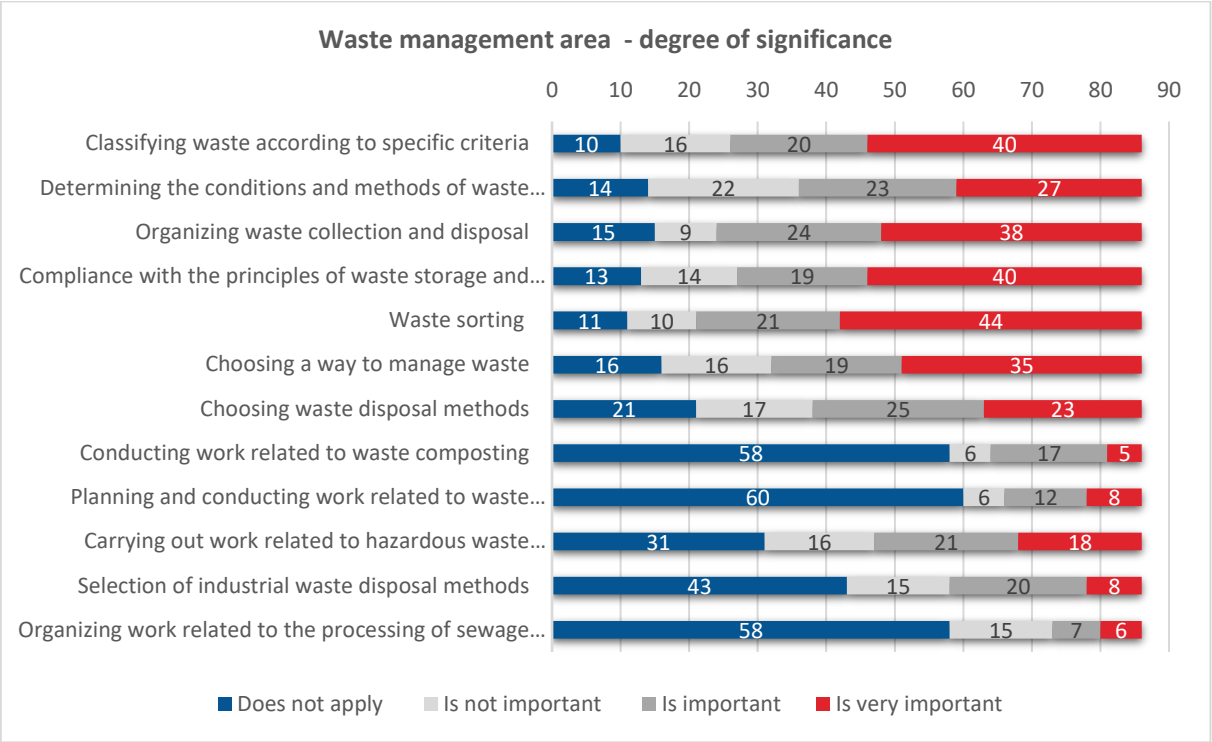
10.1.1.Waste management area

In the area of waste management, entrepreneurs attributed the greatest importance to Sorting waste (44 companies - very important, 21 companies - important), Classifying waste according to specific criteria (40 companies - very important, 20 companies - important), Observing the principles of waste storage and warehousing (40 companies - very important, 19 companies - important), Organizing waste collection and disposal (38 companies - very important, 24 companies - important) - Figure 148.

Figure 148: Level of relevance of waste management competences – all countries



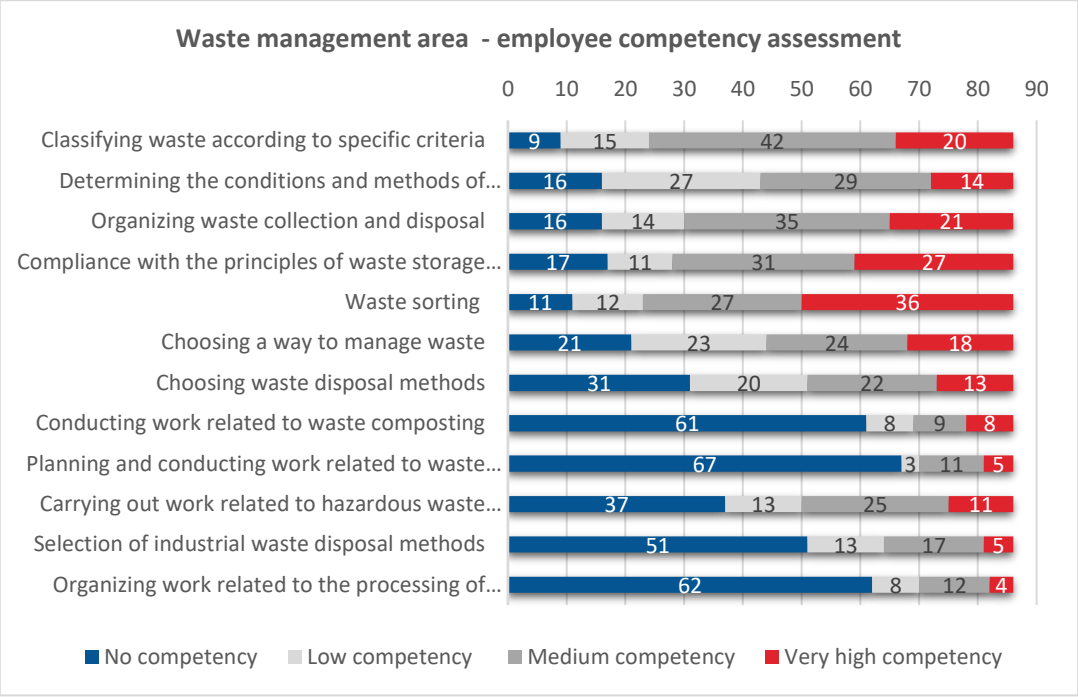
Source: Own study based on the findings of the survey, n=86; n - number of companies surveyed

According to the companies, the level of employees' competence varies (Figure 149). Medium or high competences concern: Waste sorting (very high competences - 36 indications, medium competences - 27 indications), Compliance with the rules of waste storage and disposal (very high competences - 27 indications, medium competences - 31 indications), Organization of waste collection and disposal (very high competences - 21 indications, medium competences - 35 indications), Classification of waste according to specific criteria (very high competences - 20 indications, medium competences - 42 indications).

Low or even lack of competence of the employees is reported by the employers in relation to: Planning and carrying out works related to waste incineration and operation of incineration plants (lack of competence - 67 indications, low competence - 3 indications), Organizing works related to sewage sludge treatment and equipment operation (lack of competence - 62 indications, low competence - 8 indications), Carrying out works

related to waste composting (lack of competence - 61 indications, low competence - 8 indications), Selecting methods of industrial waste disposal (lack of competence - 51 indications, low competence - 13 indications).

Figure 149: Level of competence of employees in the field of waste management – all countries



Source: Own study based on the findings of the survey, n=86; n - number of companies surveyed

Table 30 presents detailed data on the level of competence gaps in relation to waste management skills. As indicated by the data contained in the table, the largest competence gaps, understood as the difference between the level of materiality of competences and the actual skills possessed by the employees, are related to the Selection of waste management methods (competence gap at -0.40), Selection of waste disposal methods (competence gap at -0.38), Organization of waste collection and disposal (competence gap at -0.28) and Determination of conditions and methods of waste disposal (competence gap at -0.26).

Table 30: Specific competence gaps in waste management – all countries

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Waste management area	**1,45**	**1,24**	**-0,21**
1	Classifying waste according to specific criteria	2,05	1,85	-0,20

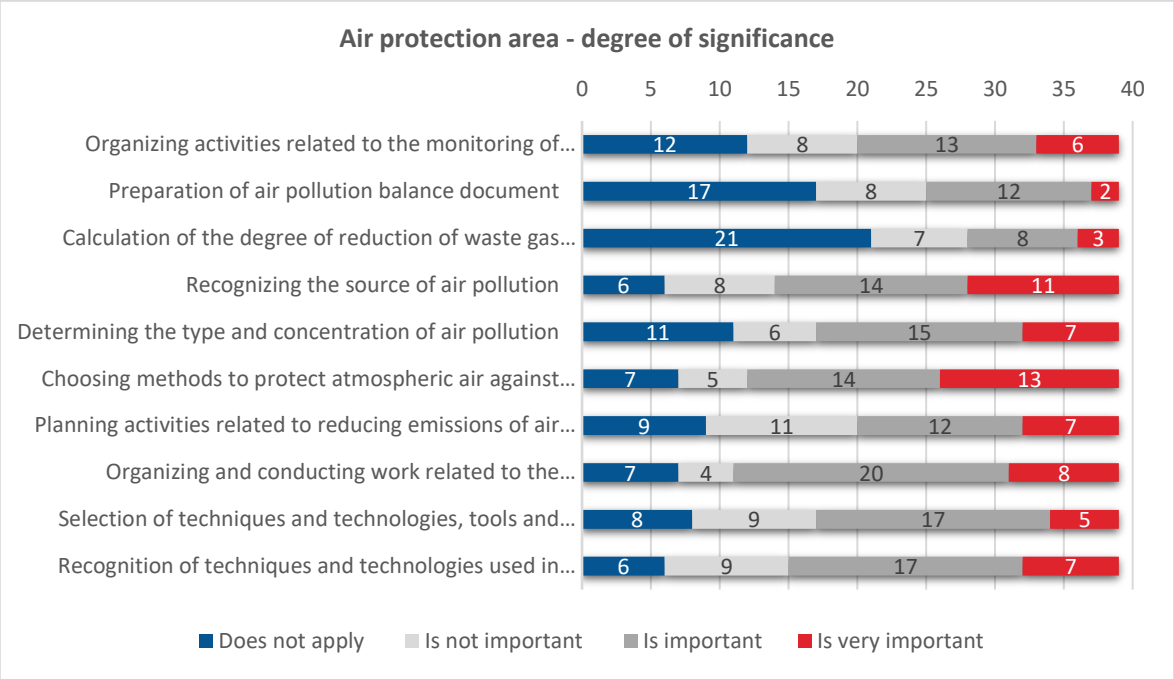
2	Determining the conditions and methods of waste disposal	1,73	1,48	**-0,26**
3	Organizing waste collection and disposal	1,99	1,71	**-0,28**
4	Compliance with the principles of waste storage and storage	2,00	1,79	-0,21
5	Waste sorting	2,14	2,02	-0,12
6	Choosing a way to manage waste	1,85	1,45	**-0,40**
7	Choosing waste disposal methods	1,58	1,20	**-0,38**
8	Conducting work related to waste composting	0,64	0,58	-0,06
9	Planning and conducting work related to waste incineration and operation of incineration plants	0,63	0,47	-0,16
10	Carrying out work related to hazardous waste management	1,30	1,12	-0,19
11	Selection of industrial waste disposal methods	0,92	0,72	-0,20
12	Organizing work related to the processing of sewage sludge and the operation of equipment	0,55	0,51	-0,03

Source: Own study based on the findings of the survey, n=86; n - number of companies surveyed

10.1.2.The air protection area

In the area of air protection, most of the competences were assessed by more than half of the companies as important or very important (Figure 150). Among them, the employers attributed the greatest importance to the Selection of methods of air protection against pollution (very important - 13 answers, important - 14 answers), Identification of the source of air pollution (very important - 11 answers, important - 14 answers), Organization and performance of works related to the removal of pollutants from the air (very important - 8 answers, important - 20 answers).

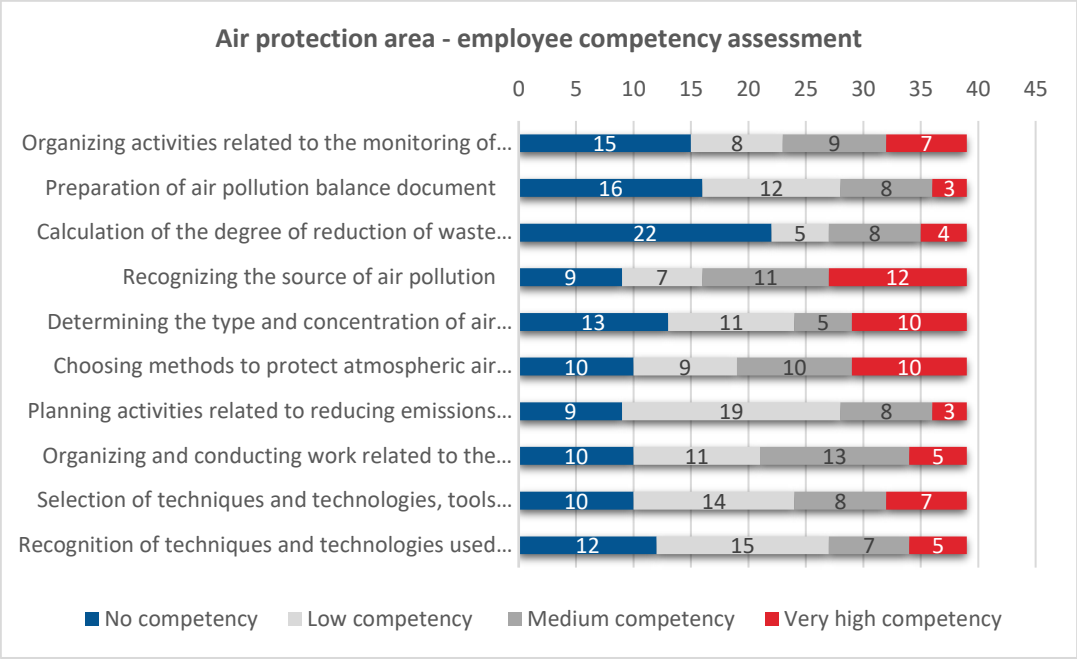
Figure 150: Level of relevance of competences in the field of air protection – all countries



Source: Own study based on the findings of the survey, n=39; n - number of companies surveyed

Entrepreneurs when asked about the level of competence of employees in the field of air protection gave the lowest assessment of skills related to Calculating the degree of reduction of waste gas pollution (lack of competence - 22 answers, low competence - 5 answers), Organizing air pollution monitoring activities (lack of competence - 15 answers, low competence - 8 answers), Preparing air pollution balances (lack of competence - 16 answers, low competence - 12 answers) and Recognition of techniques and technologies used in air protection (lack of competence - 12 answers, low competence - 15 answers) - Figure 151.

Figure 151: Employees' level of competence in the field of air protection – all countries



Source: Own study based on the findings of the survey, n=39; n - number of companies surveyed

Table 31 presents data on specific competence gaps in air protection skills. As indicated by the results, the largest competence deficits were related to the Recognition of techniques and technologies used in air protection (competence gap at level -0.51), Organization and performance of works related to the removal of pollutants from the air (competence gap at level -0.41), Selection of methods of air protection against pollution (competence gap at level -0.33), Action Planning related to the reduction of emissions of pollutants into the atmosphere (competence gap at level -0.31).

Table 31: Specific competence gaps in the field of air protection – all countries

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Air protection area	**1,45**	**1,24**	**-0,21**
1	Organizing activities related to the monitoring of atmospheric air pollution	1,33	1,21	-0,13
2	Preparation of air pollution balance document	0,97	0,95	-0,03
3	Calculation of the degree of reduction of waste gas impurities	0,82	0,85	0,03

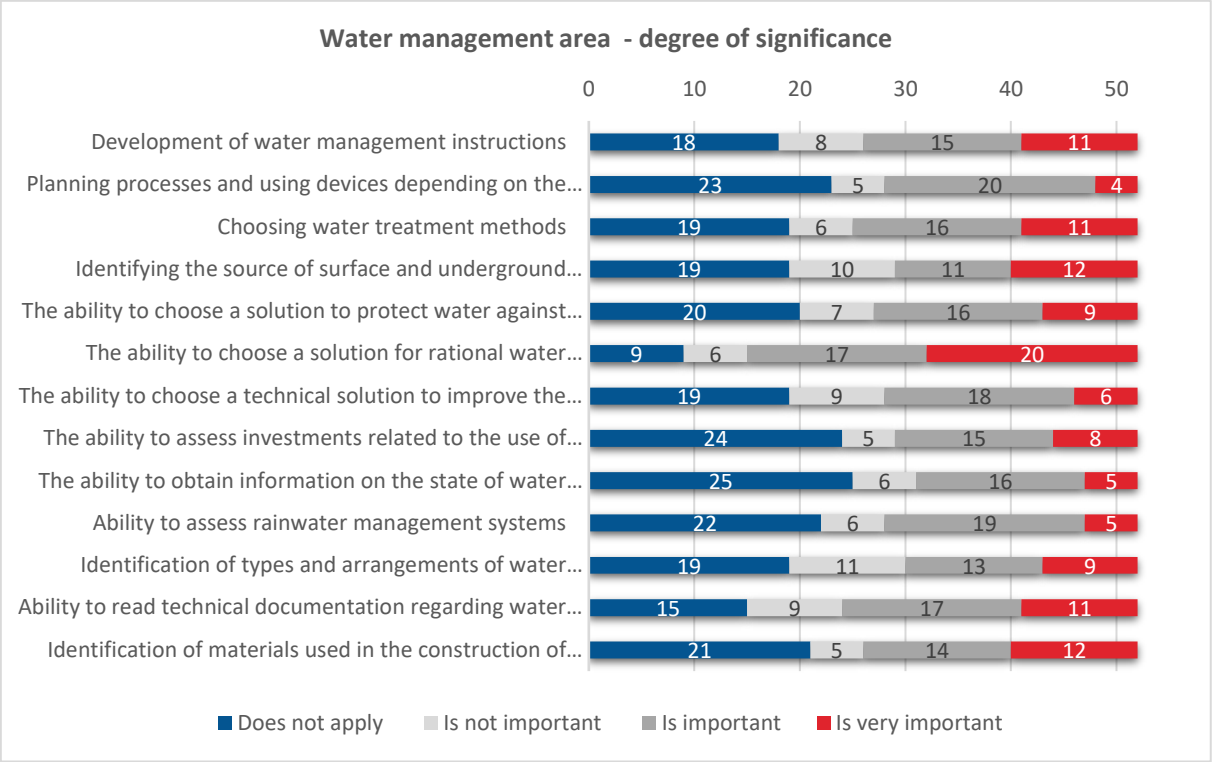
4	Recognizing the source of air pollution	1,77	1,67	-0,10
5	Determining the type and concentration of air pollution	1,46	1,31	-0,15
6	Choosing methods to protect atmospheric air against pollution	1,85	1,51	**-0,33**
7	Planning activities related to reducing emissions of air pollutants	1,44	1,13	**-0,31**
8	Organizing and conducting work related to the removal of atmospheric pollution	1,74	1,33	**-0,41**
9	Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions	1,49	1,31	-0,18
10	Recognition of techniques and technologies used in air protection	1,64	1,13	**-0,51**

Source: Own study based on the findings of the survey, n=39; n - number of companies surveyed

10.1.3. Water management area

In the area of water management, the greatest importance is attributed to the ability to select a solution for rational water consumption (very important - 20 companies, important - 17 companies), Identification of materials used for the construction of water supply systems (very important - 12 companies, important - 14 companies), Identification of the source of surface and underground water pollution (very important - 12 companies), important - 11 companies), Selecting water treatment methods (very important - 11 companies, important - 16 companies), Ability to read technical documentation on water management (very important - 11 companies, important - 17 companies), Preparing water management instructions (very important - 11 companies, important - 15 companies) - Figure 152.

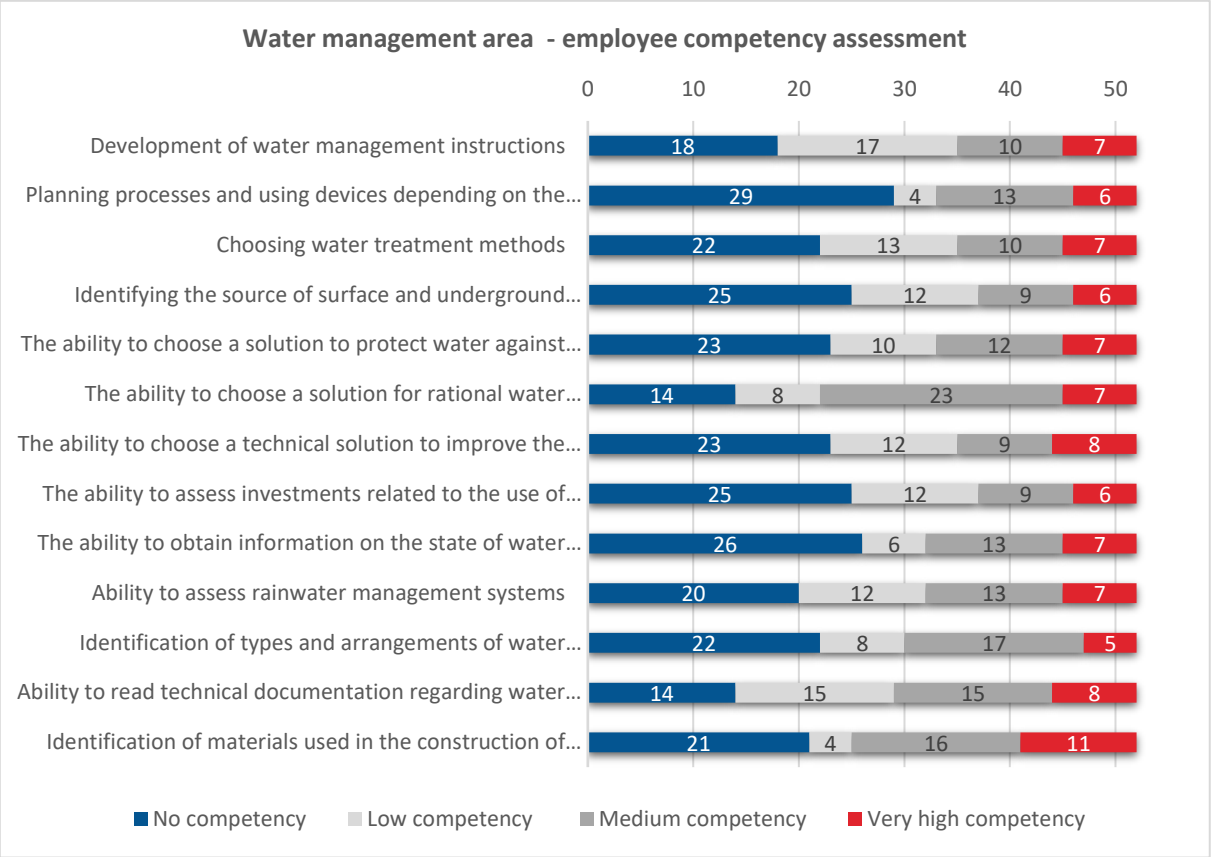
Figure 152: Level of relevance of competences in the field of water management – all countries



Source: Own study based on the findings of the survey, n=52; n - number of companies surveyed

The lowest level of competence of the employees of the surveyed companies in the area of water management concerns: Identification of the source of surface and groundwater pollution (lack of competence - 25 answers, 12 - low competence), Ability to assess investments related to the use of groundwater resources (lack of competence - 25 answers, low competence - 12 answers), Preparation of water management instructions (lack of competence - 18 answers, low competence - 17 answers), Preparation of water management instructions (lack of competence - 18 answers, low competence - 17 answers), Selection of water treatment methods (lack of competence - 22 answers, low competence - 13 answers), Ability to select a technical solution to improve the quality of water intake (lack of competence - 23 answers, low competence - 12 answers) - Figure 153.

Figure 153: Level of competence of employees in the field of water management – all countries



Source: Own study based on the findings of the survey, n=52; n - number of companies surveyed

The results of the conducted research indicate that the largest competence gaps in the area of water management concern the ability to select a solution for rational water consumption (competence gap at the level of -0.48), Identification of the source of surface water and groundwater pollution (competence gap at the level of -0.38), Selection of water treatment methods (competence gap at the level of -0.33). The level of competence gaps in particular competences is presented in Table 32.

Table 32: Specific competence gaps in water management – all countries

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Water management area	**1,30**	**1,11**	**-0,19**
1	Development of water management instructions	1,37	1,12	-0,25

2	Planning processes and using devices depending on the purpose and chemical composition	1,10	0,92	-0,17
3	Choosing water treatment methods	1,37	1,04	**-0,33**
4	Identifying the source of surface and underground water pollution	1,31	0,92	**-0,38**
5	The ability to choose a solution to protect water against secondary pollution	1,27	1,06	-0,21
6	The ability to choose a solution for rational water consumption	1,92	1,44	**-0,48**
7	The ability to choose a technical solution to improve the quality of captured water	1,21	1,04	-0,17
8	The ability to assess investments related to the use of groundwater resources	1,13	0,92	-0,21
9	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes	1,07	1,05	-0,02
10	Ability to assess rainwater management systems	1,13	1,13	0,00
11	Identification of types and arrangements of water supply networks on the company's premises	1,23	1,10	-0,13
12	Ability to read technical documentation regarding water management	1,46	1,33	-0,13
13	Identification of materials used in the construction of plumbing	1,33	1,33	0,00

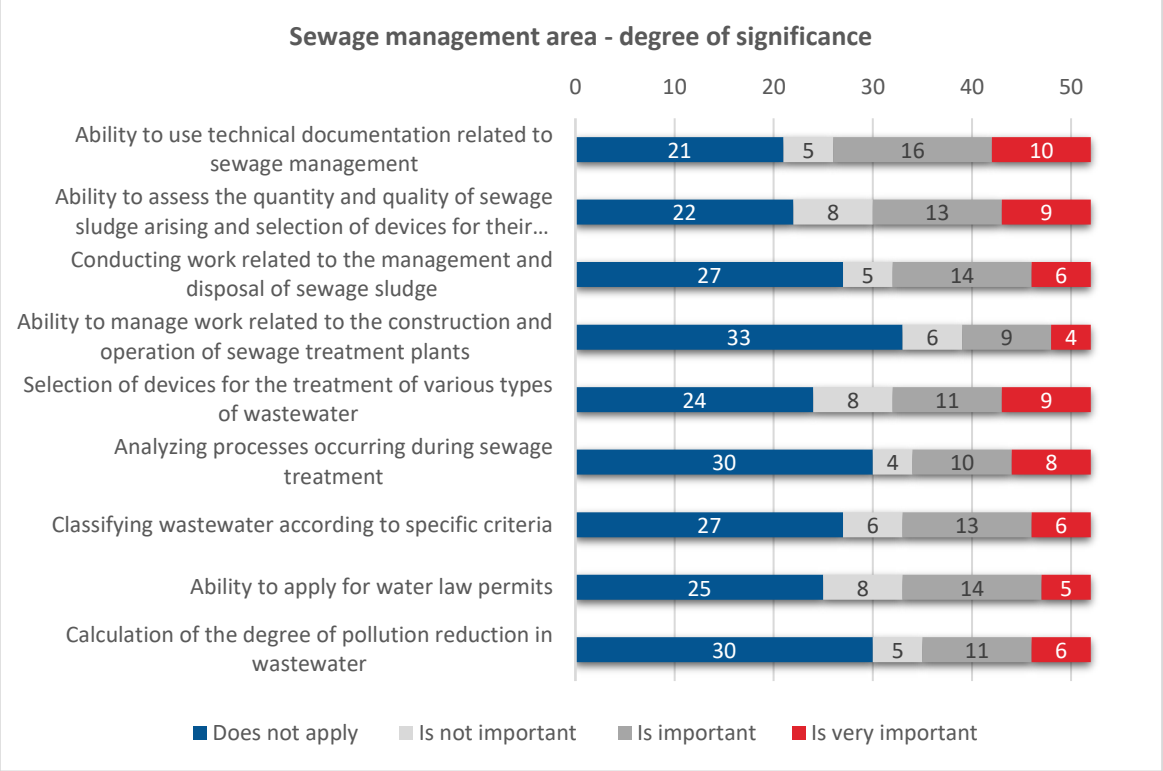
Source: Own study based on the findings of the survey, n=52; n - number of companies surveyed

10.1.4. Sewage management area

In the area of wastewater management, all competencies were considered by a large part of companies as unrelated to their core business(Figure 154). The competencies considered most important by employers included: Ability to use technical documentation related to sewage management (very important - 10 answers, important - 16 answers), Ability to assess the quantity and quality of sewage sludge generated, selection of facilities for its treatment (very important - 9 answers, important - 13 answers), Selection of facilities for

treatment of various types of sewage (very important - 9 answers, important - 11 answers), Analysis of processes occurring during sewage treatment (very important - 8 answers, important - 10 answers).

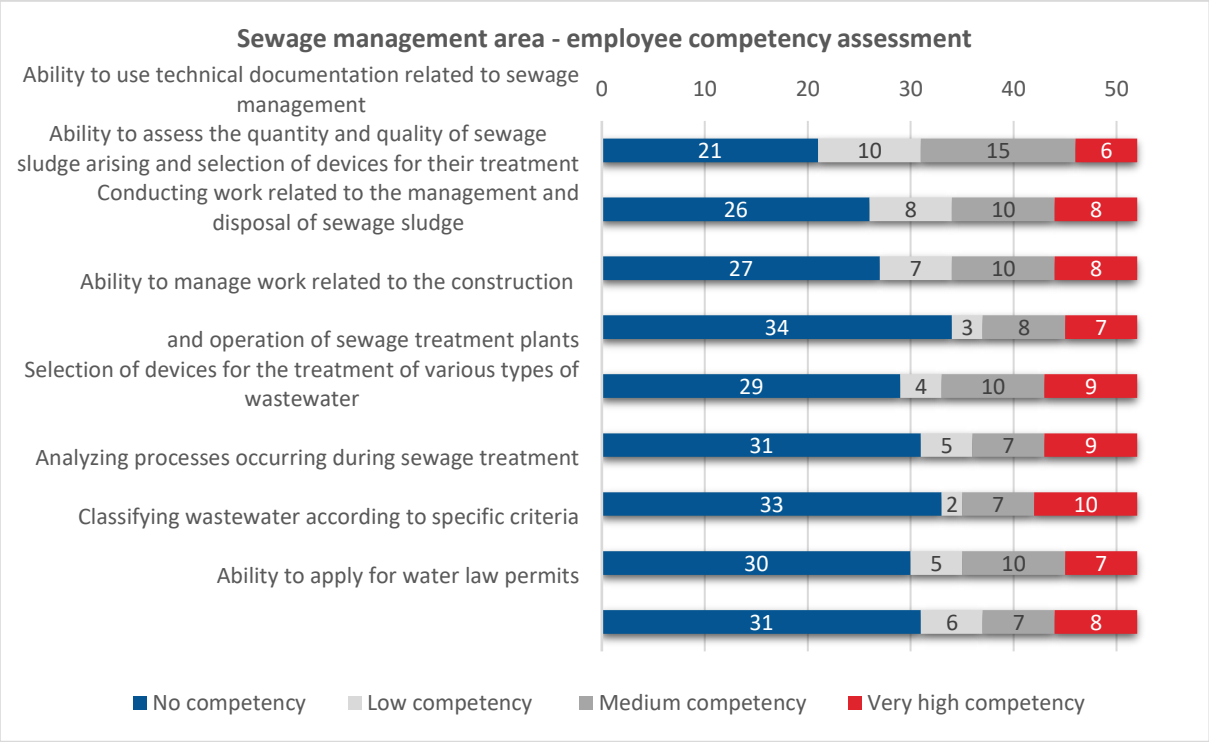
Figure 154: Level of relevance of competences in the field of wastewater management – all countries



Source: Own study based on the findings of the survey, n=52; n - number of companies surveyed

With regard to the level of competence of employees in the field of sewage management, the opinions of a large part of entrepreneurs pointed to the competence deficiencies of the candidates (Figure 155). In particular, this concerned the ability to manage works related to construction and operation of sewage treatment plants (34 answers), Classification of sewage according to specific criteria (33 answers), Calculation of the degree of pollution reduction in sewage (31 answers), Analysis of processes occurring during sewage treatment (31 answers).

Figure 155: Employees' level of competence in the field of wastewater management – all countries



Source: Own study based on the findings of the survey, n=52; n - number of companies surveyed

In the area of wastewater management, there seem to be no high levels of competence gaps (Table 33). The largest deficits concerned the Ability to use technical documentation related to sewage management (competence gap at -0.17), Ability to assess the quantity and quality of sewage sludge generated, selection of equipment for its treatment (gap at -0.17), and Selection of equipment for treatment of various types of sewage (gap at -0.12).

Table 33: Specific competence gaps in sewage management – all countries

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Sewage management area	**1,00**	**0,93**	**-0,07**
1	Ability to use technical documentation related to sewage management	1,29	1,12	**-0,17**
2	Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment	1,17	1,00	**-0,17**

3	Conducting work related to the management and disposal of sewage sludge	0,98	0,98	0,00
4	Ability to manage work related to the construction and operation of sewage treatment plants	0,69	0,77	0,08
5	Selection of devices for the treatment of various types of wastewater	1,10	0,98	**-0,12**
6	Analyzing processes occurring during sewage treatment	0,92	0,88	-0,04
7	Classifying wastewater according to specific criteria	0,96	0,88	-0,08
8	Ability to apply for water law permits	0,98	0,88	-0,10
9	Calculation of the degree of pollution reduction in wastewater	0,87	0,85	-0,02

Source: Own study based on the findings of the survey, n=52; n - number of companies surveyed

11. Education recommendations - competence profiles

11.1. Methodology of developing educational recommendations

The research presented in this Report fully confirms the initial assumption that Small and Medium Enterprises need their employees to have "green skills". The statement about existence of competence needs was confronted with opinions about the current state of employees' competences. The confrontation of competence needs and the state of competence was different in companies from various countries, but undoubtedly for the whole sample, gaps in the area of green competences were revealed. The very need for green competences and especially these competence gaps should translate into planning educational programmes in this area. The first chapter considers different approaches to developing educational programmes for green competences. On the one hand, the concepts of creating special professions and courses of education aimed at the needs of the green economy were pointed out. On the other hand, it was indicated that a more appropriate approach is to "green" existing professions with competences resulting from the needs of environmental management. Such an approach is supported by the fact that in practice green competences apply to all existing processes and jobs. This report adopts the latter approach. Without denying the possible need to create some new jobs, professions, and therefore also education directions, there is undoubtedly a need for changes in the performance of tasks on current positions, in existing professions related to the needs of environmental management. In such a perspective, there is a need to supplement traditional education programmes with knowledge, skills and attitudes necessary to meet new challenges of environmental management in existing professions. As a consequence, additional "green competences" should be indicated, with which the education process should be saturated. It becomes necessary to adapt educational programmes and training offers to the requirements of a "green economy". Taking into account the nature of the competence needs identified in this Report, it is reasonable to indicate at which level of education the given needs can be most effectively met. This applies at least to programmes at 3 levels of education:

- secondary education,
- higher education,
- lifelong learning.

According to the concept of the European Qualifications Framework (EQF), learning outcomes are defined by outlining what a learner knows, understands and is able to do after completing the learning process. Learning outcomes are listed in three categories - knowledge, skills and social competences. This indicates that qualifications - in various combinations - cover a wide range of learning outcomes, including theoretical knowledge, practical and technical skills and social competences, where the ability to work with others is

essential. Taking into account the characteristics of the different EQF levels, a qualitative analysis involving higher and secondary education experts and lifelong learning professionals assigned the identified needs for green competences into the three levels of education. It was assumed that the given learning outcome should be assigned to the best suited educational level. For some of these learning outcomes, other levels of learning that would be relevant to the development of the learning outcome were also identified. The results of the qualitative allocation of learning outcomes to the three levels of waste management education are presented in Table 34.

Table 34: Competence matrix and levels of education in the field of waste management

	Competency	Secondary education	Higher education	Lifelong learning
	Waste management area			
1	Classifying waste according to specific criteria			
2	Determining the conditions and methods of waste disposal			
3	Organizing waste collection and disposal			
4	Compliance with the principles of waste storage and storage			
5	Waste sorting			
6	Choosing a way to manage waste			
7	Choosing waste disposal methods			
8	Conducting work related to waste composting			
9	Planning and conducting work related to waste incineration and operation of incineration plants			
10	Carrying out work related to hazardous waste management			
11	Selection of industrial waste disposal methods			
12	Organizing work related to the processing of sewage sludge and the operation of equipment			

Source: Own elaboration on the basis of expert consultations by „competent judges". The darker colour indicates the key level of education for a given competence.

In the area of waste management, the most appropriate level of green competence education was most often secondary education, to which 7 learning outcomes were assigned as the first choice. Higher education proved to be particularly suitable for one learning outcome: Choosing a way to manage waste. Lifelong learning proved to be particularly suitable for one learning outcome: Classifying waste according to specific criteria, Carrying out work related to hazardous waste management, Selection of industrial waste disposal methods. In the case of Determining the conditions and methods of waste disposal outside of secondary education it is possible to shape this effect also at the level of higher education and lifelong learning. As Table 34 shows, higher education may also be relevant for other learning outcomes.

The results of the qualitative allocation of learning outcomes to the three levels of air quality education are presented in Table 35.

Table 35: Competence matrix and levels of education in the field of air protection

	Competency	Secondary education	Higher education	Lifelong learning
	Air protection area			
1	Organizing activities related to the monitoring of atmospheric air pollution			
2	Preparation of air pollution balance document			
3	Calculation of the degree of reduction of waste gas impurities			
4	Recognizing the source of air pollution			
5	Determining the type and concentration of air pollution			
6	Choosing methods to protect atmospheric air against pollution			
7	Planning activities related to reducing emissions of air pollutants			
8	Organizing and conducting work related to the removal of atmospheric pollution			
9	Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions			

10	Recognition of techniques and technologies used in air protection			

Source: Own elaboration on the basis of expert consultations by „competent judges". The darker color indicates the key level of education for a given competence.

Individual learning outcomes in the field of air protection can be assigned to three levels of education in different ways. The secondary and tertiary education levels have 3 learning outcomes each, while lifelong learning has 4 most appropriate learning outcomes. Higher education was considered to be the most suitable for shaping such effects as: Preparation of air pollution balance document, Determining the type and concentration of air pollution, Organizing and conducting work related to the removal of atmospheric pollution. It can also be used to help shape the other identified learning outcomes. Lifelong learning can also be highly useful for air protection education in addition to the four effects in which it should play a leading role. For the other four, it can be used as an aid.

The results of the qualitative allocation of learning outcomes to the three levels of water management education are presented in Table 36.

Table 36: Competence matrix and levels of education in the field of water management

	Competency	Secondary education	Higher education	Lifelong learning
	Water management area			
1	Development of water management instructions			
2	Planning processes and using devices depending on the purpose and chemical composition			
3	Choosing water treatment methods			
4	Identifying the source of surface and underground water pollution			
5	The ability to choose a solution to protect water against secondary pollution			
6	The ability to choose a solution for rational water consumption			
7	The ability to choose a technical solution to improve the quality of captured water			
8	The ability to assess investments related to the use of groundwater resources			

9	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes			
10	Ability to assess rainwater management systems			
11	Identification of types and arrangements of water supply networks on the company's premises			
12	Ability to read technical documentation regarding water management			
13	Identification of materials used in the construction of plumbing			

Source: Own elaboration on the basis of expert consultations by „competent judges". The darker color indicates the key level of education for a given competence.

The experts determined that in the area of water management, secondary education is the least adequate to shape learning outcomes. Only one effect is assigned here as the most appropriate: Identification of types and arrangements of water supply networks on the company's premises. On the other hand, higher education and lifelong learning can be used to a similar extent to shape the learning outcomes in the green competence area of water management. 6 learning outcomes have been allocated to higher education and 5 learning outcomes to lifelong learning. It is worth noting, however, that higher education can also be used to shape the next 5 learning outcomes. This situation seems to be understandable, as by nature higher education is able to provide learning outcomes assigned to lower levels, yet the efficiency of the whole education system should assume optimal use of particular levels of education. Therefore, it is more appropriate to use higher education rather in those cases where it is not possible to shape learning outcomes at other, lower, levels.

The results of the qualitative allocation of learning outcomes to the three levels of wastewater education are presented in Table 37.

Table 37: Competence matrix and levels of education in the field of sewage management

	Competency	Secondary education	Higher education	Lifelong learning
	Sewage management area			
1	Ability to use technical documentation related to sewage management			

2	Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment			
3	Conducting work related to the management and disposal of sewage sludge			
4	Ability to manage work related to the construction and operation of sewage treatment plants			
5	Selection of devices for the treatment of various types of wastewater			
6	Analyzing processes occurring during sewage treatment			
7	Classifying wastewater according to specific criteria			
8	Ability to apply for water law permits			
9	Calculation of the degree of pollution reduction in wastewater			

Source: Own elaboration on the basis of expert consultations by „competent judges". The darker color indicates the key level of education for a given competence.

Shaping learning outcomes in the area of wastewater management, as well as water management, requires, to the greatest extent, the participation of lifelong learning and higher education. Also here, secondary education is the most appropriate level of education in relation to only one learning outcome. On the other hand, 4 learning outcomes in the area of wastewater management have been assigned to lifelong learning and higher education. Here too, higher education turns out to be the most universal, as it can play a supporting role in shaping all other learning outcomes. However, as already indicated above, in practice it will be more reasonable to shape these learning outcomes within the framework of lifelong learning, which turns out to be appropriate for such outcomes as: Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment, Selection of devices for the treatment of various types of wastewater, Classifying wastewater according to specific criteria, Calculation of the degree of pollution reduction in wastewater.

Taking into account all of the identified learning outcomes on green competences in 4 areas: waste management, air protection, water and waste water management, along with their relation to the 3 levels of education, recommendations can be made for 'greening' of education programmes.

11.2. Recommendations for secondary vocational training

Taking into account the needs of green competencies in Small and Medium Enterprises grouped into 4 areas: waste management, air protection, water management and sewage management, and taking into account the specificity of secondary education, it can be recommended to green the curricula in terms of learning outcomes indicated in Table 38.

Table 38: Competences recommended for secondary education

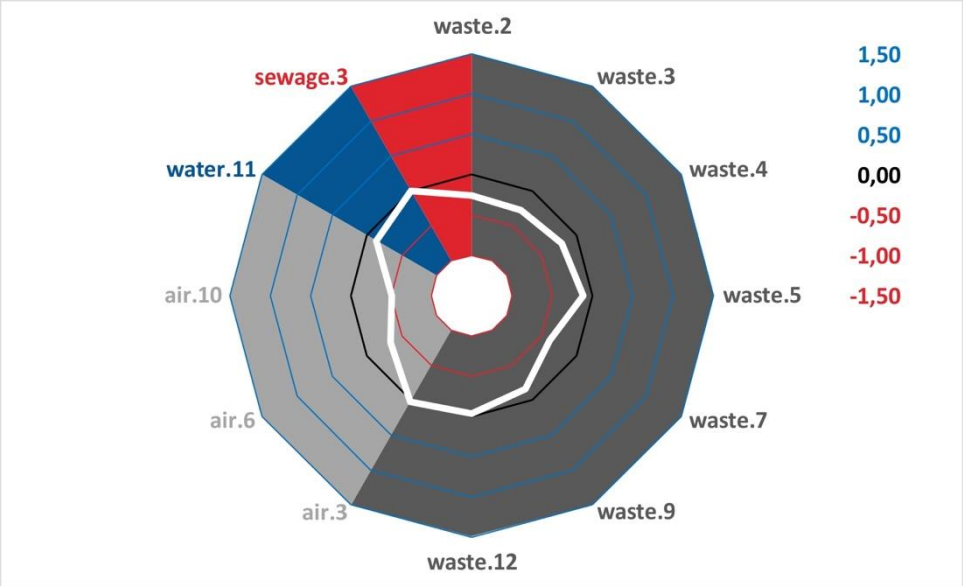
	Competency	Competence profile
	Waste management area	
2	Determining the conditions and methods of waste disposal	waste.2
3	Organizing waste collection and disposal	waste.3
4	Compliance with the principles of waste storage and storage	waste.4
5	Waste sorting	waste.5
7	Choosing waste disposal methods	waste.7
9	Planning and conducting work related to waste incineration and operation of incineration plants	waste.9
12	Organizing work related to the processing of sewage sludge and the operation of equipment	waste.12
	Air protection area	
3	Calculation of the degree of reduction of waste gas impurities	air.3
6	Choosing methods to protect atmospheric air against pollution	air.6
10	Recognition of techniques and technologies used in air protection	air.10
	Water management area	
11	Identification of types and arrangements of water supply networks on the company's premises	water.11
	Sewage management area	

3	Conducting work related to the management and disposal of sewage sludge	sewage.3

Source: Own elaboration on the basis of expert consultations by „competent judges".

Secondary education may be an appropriate level for shaping green competences in each of the analysed areas (Table 38), but its greatest role lies in learning outcomes related to waste management. In secondary education as many as 7 learning outcomes from the area of waste management can be shaped, 3 from the area of air protection and one from the area of water and sewage management. These recommendations refer to the category of competence needs of Small and Medium Enterprises, however, without taking into account the state of the relevant competence of businesses' current employees. However, the survey in the whole population of 99 enterprises includes the question not only about the necessary competences, but also about their relevance and the assessment of the competences of employees. The answers were to help identify "COMPETENCE GAPS" understood as the difference between the competence needs and competencies of companies in the green economy. Differences between the degree of relevance and the level of competence were treated as competence gaps and for the entire surveyed population are presented in Tables 30, 31, 32, and 33 respectively for 4 areas: waste management, air protection, water and waste water management. On the basis of the information on competence gaps and after assigning learning outcomes that are optimal for the implementation of secondary education, a competence profile of green competences of secondary education can be proposed. A profile for the whole surveyed sample of 99 enterprises in 7 countries is presented in Figure 156.

Figure 156: Competency profile at secondary education level – all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

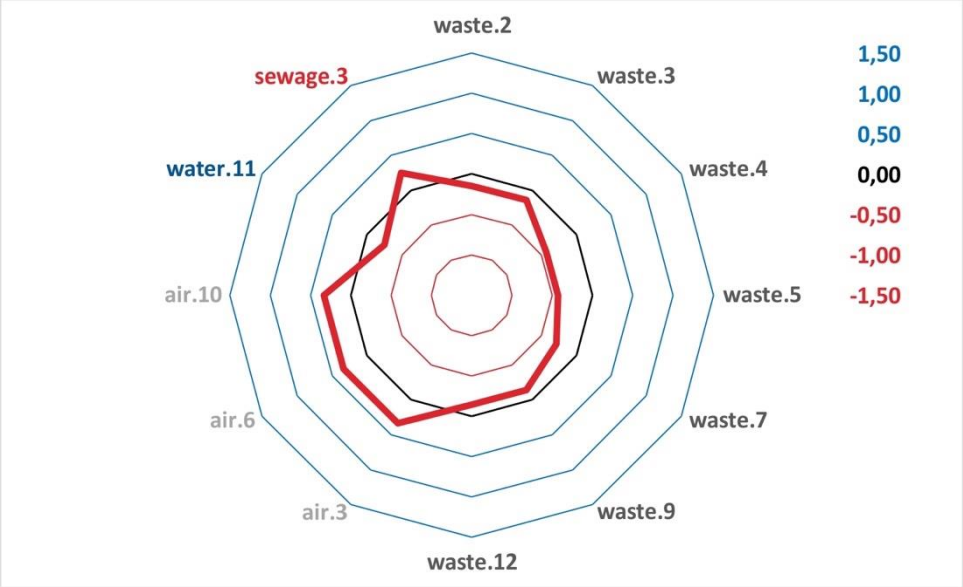
The figure shows that in secondary education programmes such effects of green competence education as: Determining the conditions and methods of waste disposal (waste.2); Organizing waste collection and disposal (waste.3); Compliance with the principles of waste storage and storage (waste.4); Choosing waste disposal methods (waste.7); Planning and conducting work related to waste incineration and operation of incineration plants (waste.9); Choosing methods to protect atmospheric air against pollution (air.6); Recognition of techniques and technologies used in air protection (air.10).

This does not mean that the remaining learning outcomes of green competences specific to the secondary level should be omitted from education programmes, but the level of the gap indicates current priorities.

This average picture of competence gaps relating to green competences for secondary education does not have to be relevant to the situation in individual countries. Therefore, on the basis of surveys of companies in a given country, green competence profiles for secondary education have been developed for each country.

The data on the green competence profile for secondary education in Austria are presented in Figure 157.

Figure 157: Competency profile at secondary education level – Austria



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

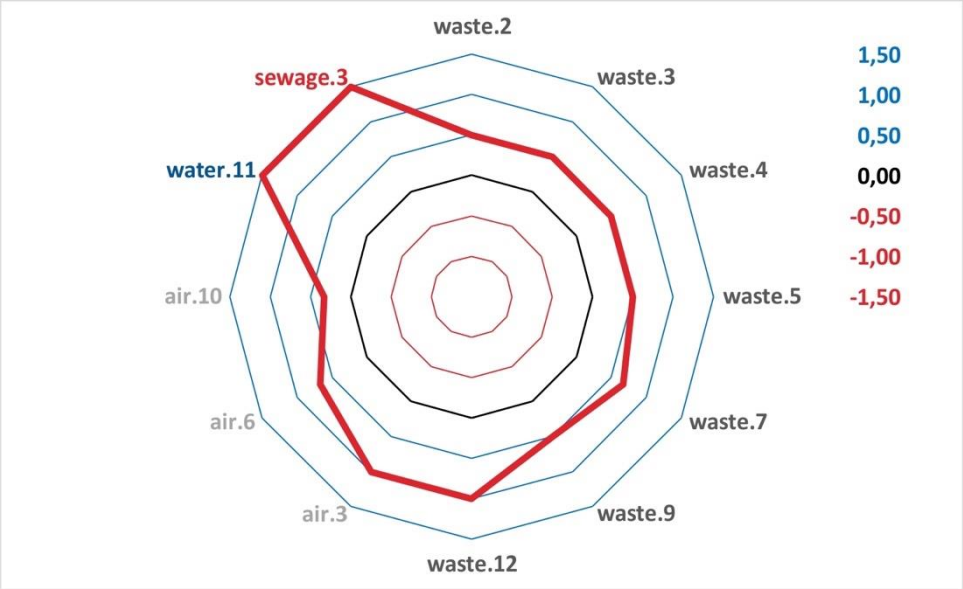
In Austria, the level of competence gaps in relation to secondary education shows that the educational programmes should place particular emphasis on learning outcomes such as: Compliance with the principles of waste storage and storage (waste.4); Waste sorting (waste.5); Choosing waste disposal methods (waste.7); Planning and conducting work related to waste incineration and operation of incineration plants (waste.9); Identification of types and arrangements of water supply networks on the company's premises (water.11) .

For the other learning outcomes, gaps are minimal or even existing employee competences exceed the current requirements, as assessed by enterprises (gap level is positive). Competence surpluses concern mainly:

Conducting work related to the management and disposal of sewage sludge (sewage.3); Calculation of the degree of reduction of waste gas impurities (air.3); Choosing methods to protect atmospheric air against pollution (air.6); Recognition of techniques and technologies used in air protection (air.10). While existence of such surplus competences should be viewed positively, it does not mean that these areas should not be included in education programmes. It rather indicates they do not have to be a priority.

The data on the green competence profile for secondary education in Finland are presented in Figure 158.

Figure 158: Competency profile at secondary education level – Finland

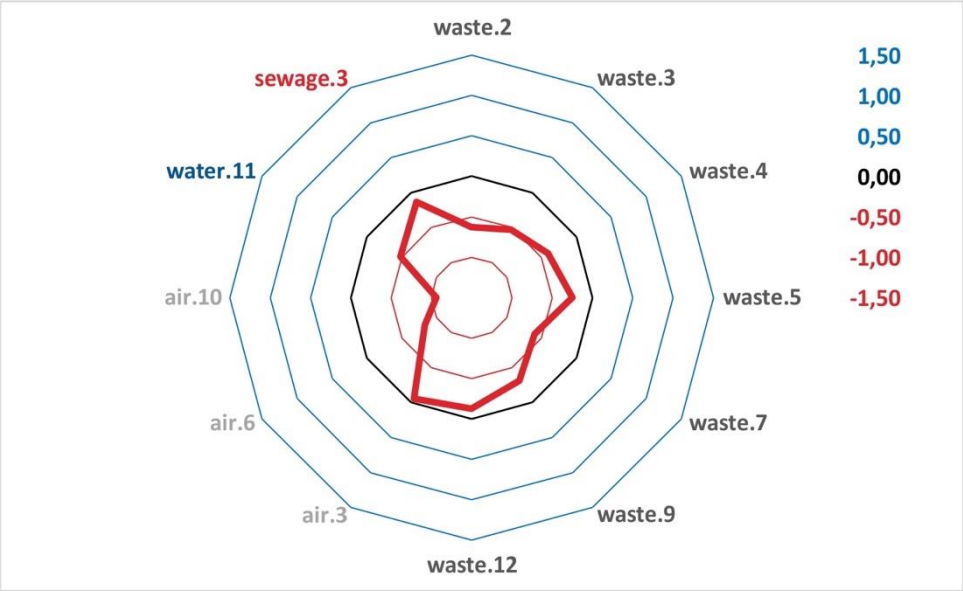


Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

In the case of Finland, the surveyed companies gave a very high rating to the level of employee competences in terms of green competency relevant to secondary school education. The competence profile indicates that in all of the considered learning outcomes there were positive competence gaps, meaning that the level of competence of those emplyees exceeded the needs of enterprises. This may signify that there are good educational practives in this country. Nevertheless, all of the analysed outcomes of learning in secondary school should be covered by educational curricula.

Information on the profile of green competences in secondary education in Lithuania is presented in Figure 159.

Figure 159: Competency profile at secondary education level – Lithuania



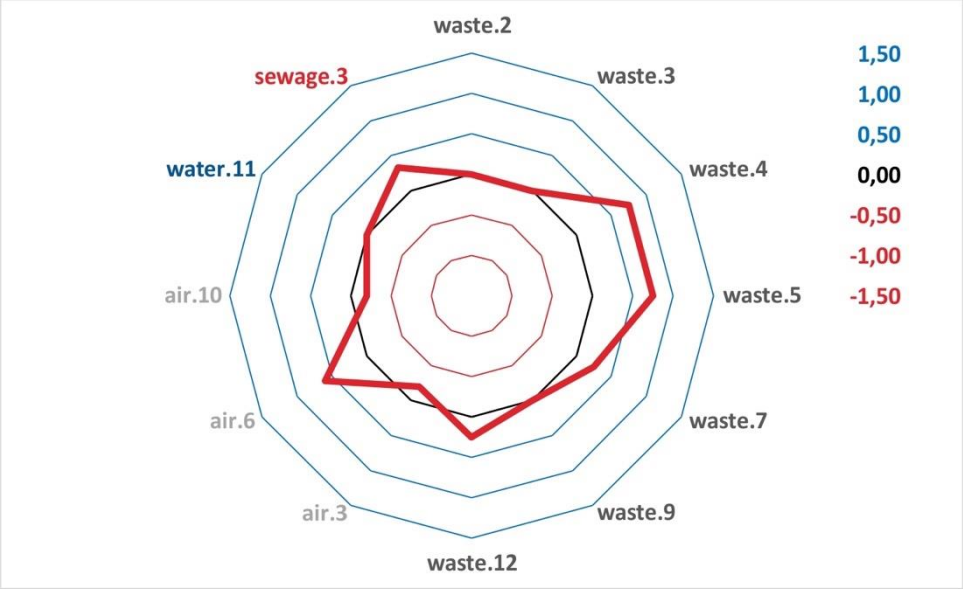
Source: Own study based on the findings of the survey, n=38; n - number of companies surveyed

The level of competence gaps identified in research conducted in Lithuania in relation to secondary education shows that the educational programmes should place particular emphasis on learning outcomes such as: Recognition of techniques and technologies used in air protection (air.10); Choosing methods to protect atmospheric air against pollution (air.6); Determining the conditions and methods of waste disposal (waste.2); Choosing waste disposal methods (waste.7); Organizing waste collection and disposal (waste.3); Compliance with the principles of waste storage and storage (waste.4).

This does not mean that the remaining learning outcomes of green competences specific to the secondary level should be omitted from education programmes, but the level of the gap indicates current priorities.

The data on the green competence profile for secondary education in Germany are presented in Figure 160.

Figure 160: Competency profile at secondary education level – Germany



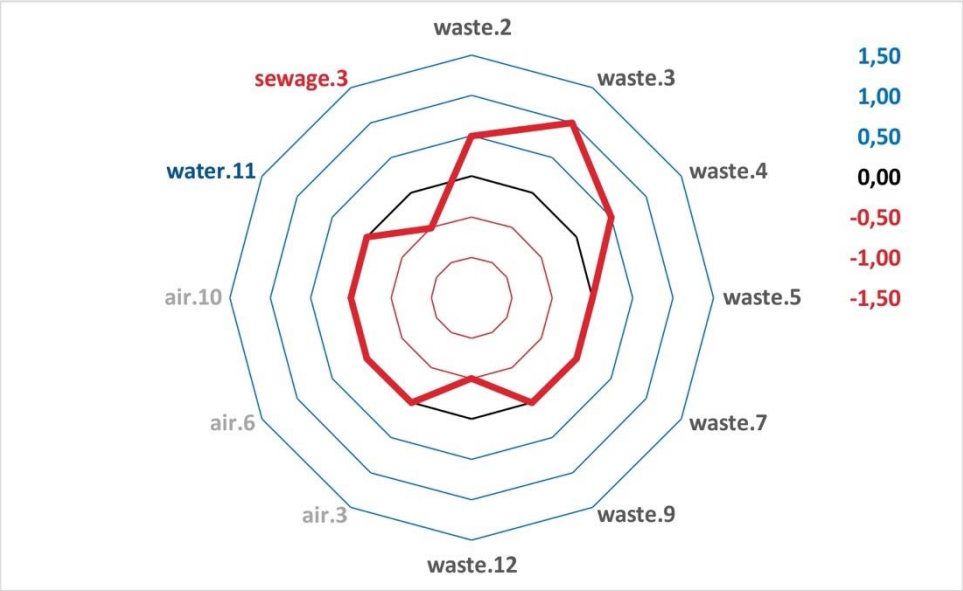
Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

The figure shows that Germany's secondary education programmes special emphasis should be placed on such green competence learning outcomes as: Calculation of the degree of reduction of waste gas impurities (air.3); Recognition of techniques and technologies used in air protection (air.10).

For the remaining learning outcomes, there are no gaps or even existing employee competences exceed the current requirements in the assessment of enterprises (gap level is positive). Competence surpluses concern mainly: Compliance with the principles of waste storage and storage (waste.4); Waste sorting (waste.5); Choosing methods to protect atmospheric air against pollution (air.6). The existence of such surplus competences should be viewed positively, but it does not mean that these areas should not be included in education programmes. Rather, they do not have to be a priority.

Information on the profile of green competences for secondary education in Norway is presented in Figure 161.

Figure 161: Competency profile at secondary education level – Norway



Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In Norway, the level of competence gaps related to secondary education shows that the educational programmes should place particular emphasis on such learning outcomes as: Conducting work related to the management and disposal of sewage sludge (sewage.3); Organizing work related to the processing of sewage sludge and the operation of equipment (waste.12).

For the remaining learning outcomes, gaps are minimal or even existing workers' competences exceed current needs, as assessed by enterprises, and therefore the level of the gap is positive. The competence gaps are primarily concerned with: Organizing waste collection and disposal (waste.3); Determining the conditions and methods of waste disposal (waste.2); Compliance with the principles of waste storage and storage (waste.4). The existence of such surplus competences should be viewed positively, but it does not mean that these areas should not be included in education programmes. Rather, they do not have to be a priority.

Figure 162 presents information on the profile of green competences for secondary education in Poland.

Figure 162: Competency profile at secondary education level – Poland

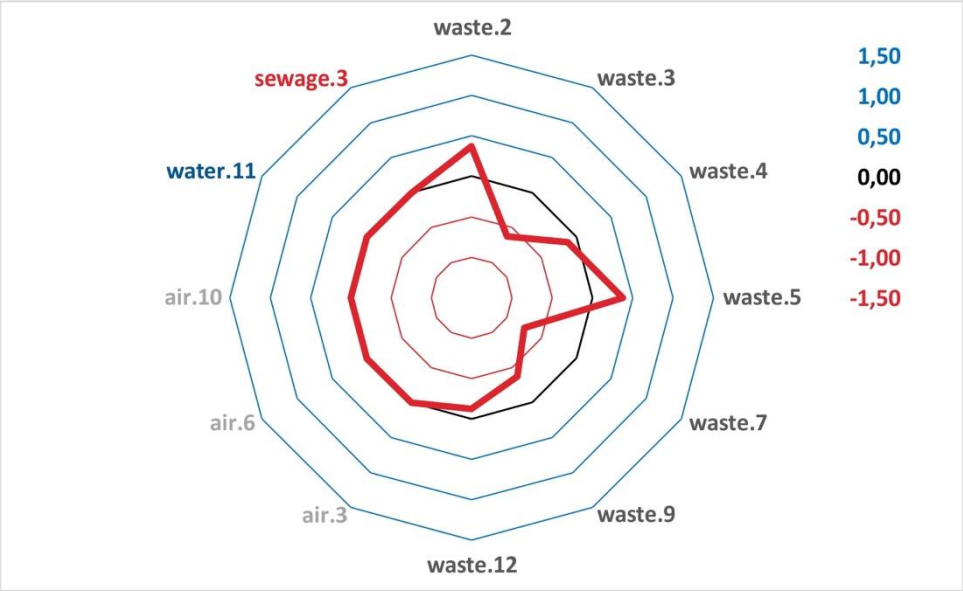
Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

In Poland, the level of competence gaps in relation to secondary education shows that in educational programmes it is worth to put particular emphasis on such learning outcomes as: Choosing methods to protect atmospheric air against pollution (air.6); Organizing waste collection and disposal (waste.3); Compliance with the principles of waste storage and storage (waste.4); Waste sorting (waste.4); Choosing waste disposal methods (waste.7).

For the remaining learning outcomes, gaps are minimal or even in one case the existing competences of employees exceed the current requirements in the assessment of enterprises (gap level is positive). The surplus competence concerns: Identification of types and arrangements of water supply networks on the company's premises (water.11). The existence of such a competence surplus should be assessed in a positive way, but this does not mean that this area should not be included in educational curricula, but it does not have to be a priority.

The data on the green competence profile for secondary education in Hungary are presented in Figure 163.

Figure 163: Competency profile at secondary education level – Hungary



Source: Own study based on the findings of the survey, n=11; n - number of companies surveyed

In Hungary, the level of competence gaps in relation to secondary education shows that educational programmes should place particular emphasis on learning outcomes such as: Choosing waste disposal methods (waste.7); Organizing waste collection and disposal (waste.3); Planning and conducting work related to waste incineration and operation of incineration plants (waste.9).

For the remaining learning outcomes, gaps are minimal or even existing employee competences exceed the current requirements in the assessment of enterprises, so the gap level is positive. Competence surpluses concern mainly: Determining the conditions and methods of waste disposal (waste.2); Waste sorting (waste.5). The existence of such surplus competences should be viewed positively, but they do not mean that these areas should not be included in education curricula, but do not have to be prioritised.

11.3. Recommendations for higher-level vocational training

Taking into account the needs of green competencies of Small and Medium Enterprises grouped into 4 areas: waste management, air protection, water management and waste water management, taking into account the specificity of higher education, it can be recommended to green the curricula in terms of learning outcomes indicated in Table 39.

Table 39: Competences recommended for higher education

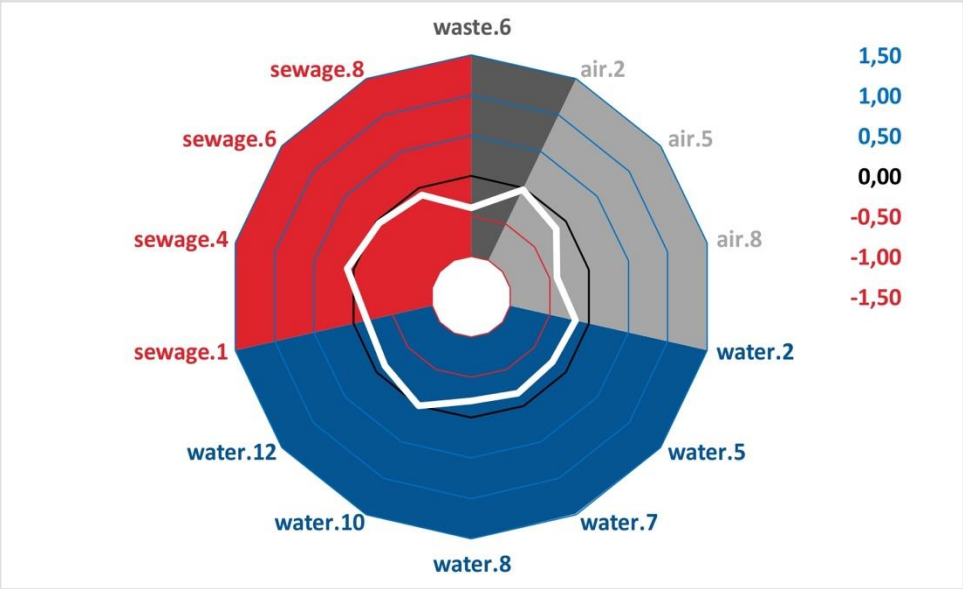
	Competency	Competence profile
	Waste management area	
6	Choosing a way to manage waste	waste.6
	Air protection area	
2	Preparation of air pollution balance document	air.2
5	Determining the type and concentration of air pollution	air.5
8	Organizing and conducting work related to the removal of atmospheric pollution	air.8
	Water management area	
2	Planning processes and using devices depending on the purpose and chemical composition	water.2
5	The ability to choose a solution to protect water against secondary pollution	water.5
7	The ability to choose a technical solution to improve the quality of captured water	water.7
8	The ability to assess investments related to the use of groundwater resources	water.8
10	Ability to assess rainwater management systems	water.10
12	Ability to read technical documentation regarding water management	water.12
	Sewage management area	
1	Ability to use technical documentation related to sewage management	sewage.1

4	Ability to manage work related to the construction and operation of sewage treatment plants	sewage.4
6	Analyzing processes occurring during sewage treatment	sewage.6
8	Ability to apply for water law permits	sewage.8

Source: Own elaboration on the basis of expert consultations by „competent judges".

Higher education may be an appropriate level of shaping green competences in each of the analysed areas (Table 39). However, its greatest role lies in the learning outcomes related to water management. In higher education, as many as 6 learning outcomes from the area of water management, 4 from the area of sewage management, 3 from the area of air protection and one from the area of waste management can be shaped. These recommendations refer to the category of competence needs of Small and Medium Enterprises, however, without taking into account the state of competences of current employees of enterprises in this respect. However, the survey in the whole population of 99 enterprises includes the question not only about the required competences, but also about their significance and the assessment of the employees' competences. The answers were to help identify to "COMPETENCE GAPS" defined as the difference between the competence needs and competencies of companies in the green economy. Differences between the degree of relevance and the level of competence were treated as competence gaps and for the entire surveyed population are presented in Tables 30, 31, 32, and 33, respectively for 4 areas: waste management, air protection, water and waste water management. On the basis of this information on competence gaps and after assigning learning outcomes that are optimal for the implementation of higher education, a competence profile of green competences of higher education can be proposed. The profile for the whole surveyed sample of 99 enterprises in 7 countries is presented in Figure 164.

Figure 164: Competency profile at higher education level – all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

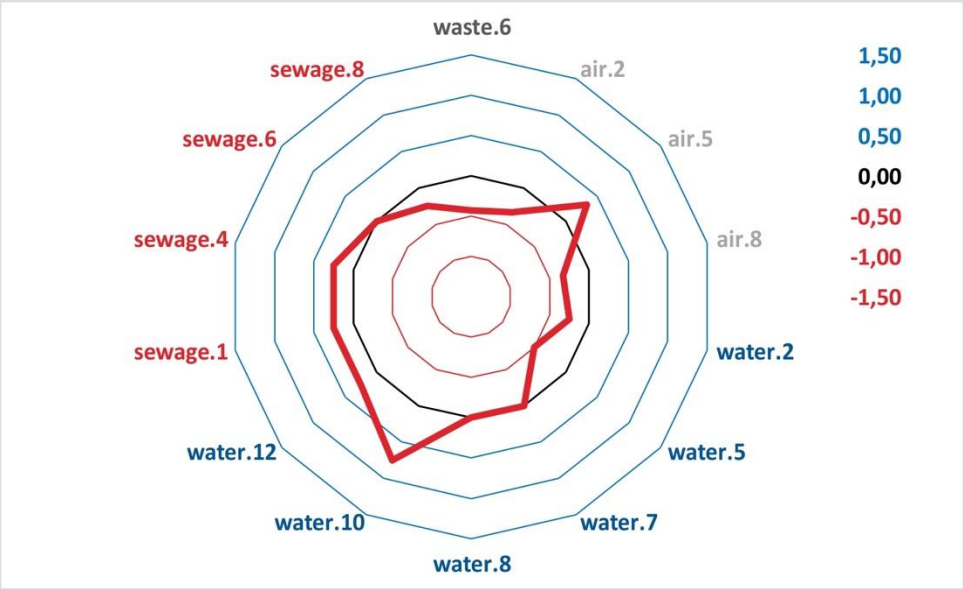
The figure indicates that in higher education programmes, emphasis should be placed on such green competence learning outcomes as: Choosing a way to manage waste (waste.6); Organizing and conducting work related to the removal of atmospheric pollution (air.8).

This does not mean that the remaining learning outcomes of green competencies relevant to the level of higher education should be left out of the curriculum, but the level of the gap indicates current priorities.

This average picture of competence gaps relating to green competencies for higher education does not have to be relevant to the situation in individual countries. Therefore, country-specific green competence profiles for higher education have been developed on the basis of surveys of companies in the specific country.

The data on the green competence profile for higher education in Austria are presented in Figure 165.

Figure 165: Competency profile at higher education level – Austria



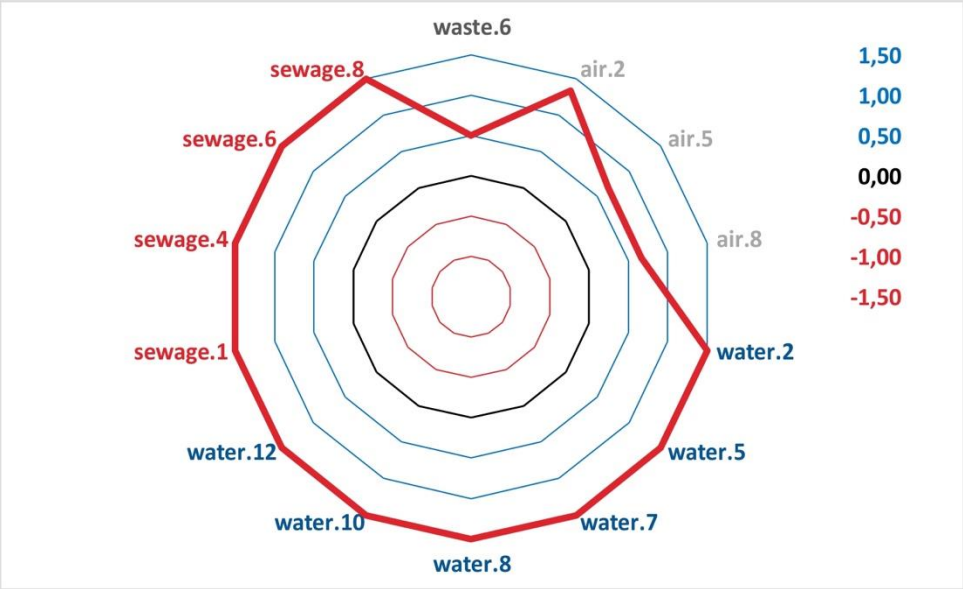
Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

In Austria, the level of competence gaps in higher education shows that curricula should place particular emphasis on learning outcomes such as: The ability to choose a solution to protect water against secondary pollution (water.5); Choosing a way to manage waste (waste.6); Organizing and conducting work related to the removal of atmospheric pollution (air.8).

For the other learning outcomes, gaps are minimal or even existing employee competences exceed the current requirements in the assessment of enterprises (gap level is positive). Competence surpluses concern mainly: Ability to assess rainwater management systems (water.10); Determining the type and concentration of air pollution (air.5); Ability to use technical documentation related to sewage management (sewage.1); Ability to manage work related to the construction and operation of sewage treatment plants (sewage.4). The existence of such competence surpluses should be assessed positively, yet they do not mean that these areas should not be included in educational curricula, but do not have to be a priority.

The data on the green competence profile for higher education in Finland are presented in Figure 166.

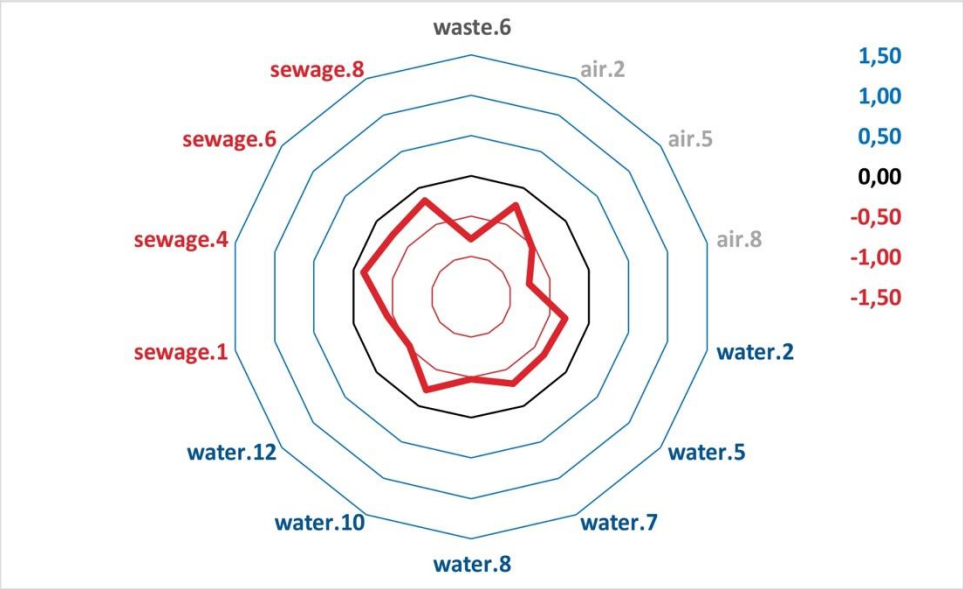
Figure 166: Competency profile at higher education level – Finland



Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

In the case of Finland, the surveyed companies rated very highly the level of competence of employees in green competences relevant to higher education. The competence profile indicates that there are positive competence gaps for all considered learning outcomes and therefore the competence level of employees exceeds the requirements of the companies. This may indicate already good educational practices in this country. Nevertheless, it is worthwhile to continue to include all the analysed learning outcomes for higher education in the curricula.

Figure 167: Competency profile at higher education level – Lithuania



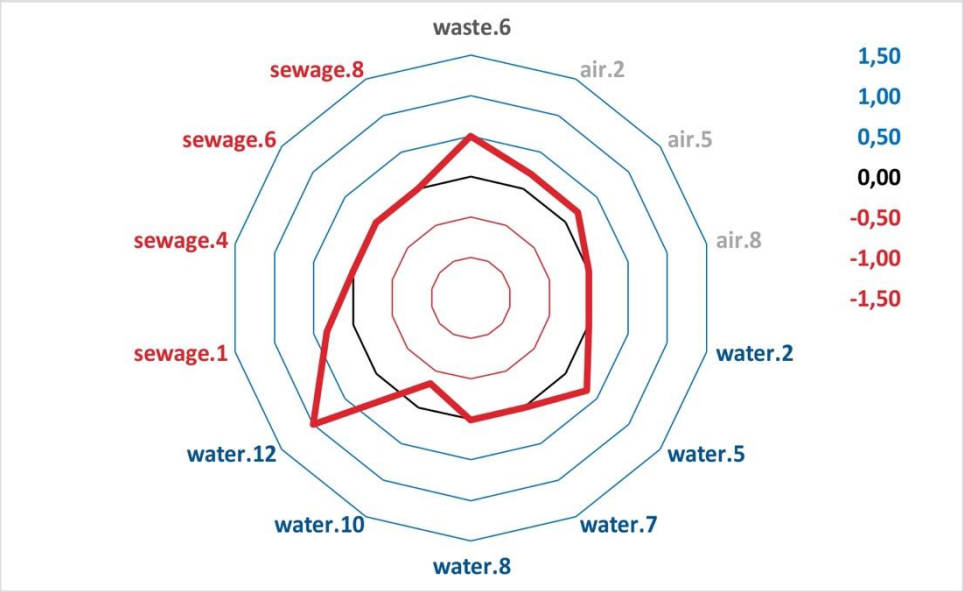
Source: Own study based on the findings of the survey, n=38; n - number of companies surveyed

In Lithuania, the level of competence gaps relating to higher education shows that the educational programmes should place particular emphasis on learning outcomes such as: Choosing a way to manage waste (waste.6); Organizing and conducting work related to the removal of atmospheric pollution (air.8); Organizing and conducting work related to the removal of atmospheric pollution (air.5); The ability to assess investments related to the use of groundwater resources (water.8); Ability to read technical documentation regarding water management (water.12); Ability to use technical documentation related to sewage management (sewage.1).

For the remaining competences, gaps are minimal, but despite this, all analysed learning outcomes for higher education should be taken into account in curricula.

The data on the green competence profile for secondary education in Germany are presented in Figure 168.

Figure 168: Competency profile at higher education level – Germany

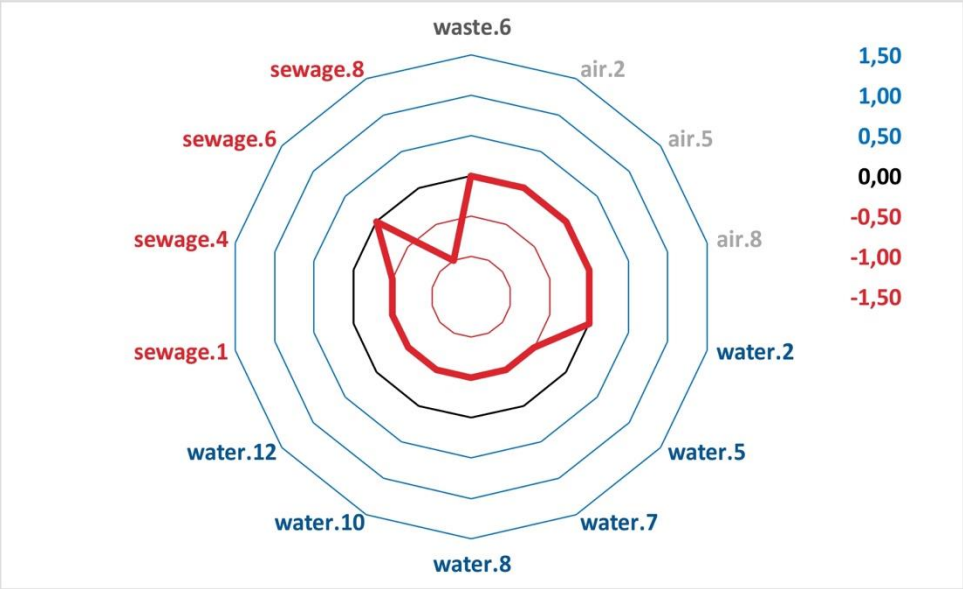


Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

In the case of Germany, the surveyed companies rated highly their employees' competency in the area green competences relevant to higher education. The competence profile indicates that there are zero or positive competence gaps for the majority of the learning outcomes considered, which means that the competence level of employees corresponds to or even exceeds the requirements of the companies. This is particularly evident in the case of: Ability to read technical documentation regarding water management (water.12); Choosing a way to manage waste (waste.6); The exception is Ability to assess rainwater management systems (water.10) - a negative gap has been noted for this competence. This means that it is worthwhile to place particular emphasis on this learning outcome in education programmes. The aforementioned excesses of competences should be assessed positively, bearing in mind that these areas should also be included in education programmes, but do not have to be prioritised.

The data on the profile of green competences for secondary education in Norway are presented in Figure 169.

Figure 169: Competency profile at higher education level – Norway



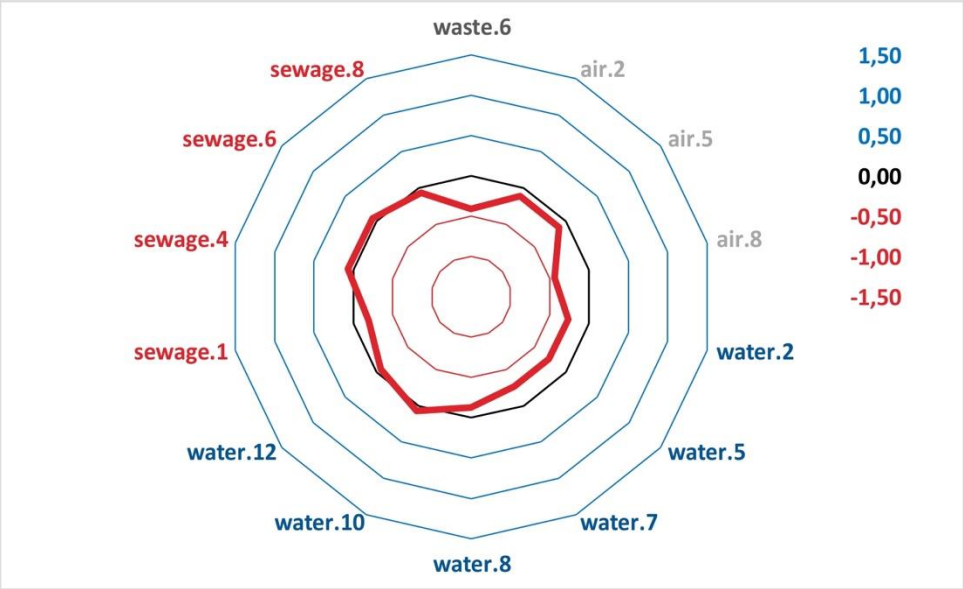
Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In Norway, the level of competence gaps in relation to higher education shows that the educational programmes should place particular emphasis on learning outcomes such as: Ability to apply for water law permits (sewage.8); The ability to choose a solution to protect water against secondary pollution (water.5); The ability to choose a technical solution to improve the quality of captured water (water.7); The ability to assess investments related to the use of groundwater resources (water.8); Ability to assess rainwater management systems (water.10); Ability to read technical documentation regarding water management (water.12); Ability to use technical documentation related to sewage management (sewage.1).

This does not mean that the remaining green competence learning outcomes relevant to the level of higher education should be left out of the curriculum, but the level of the gap indicates current priorities for Norway.

Information on the profile of green competences for higher education in Poland is presented in Figure 170.

Figure 170: Competency profile at higher education level – Poland

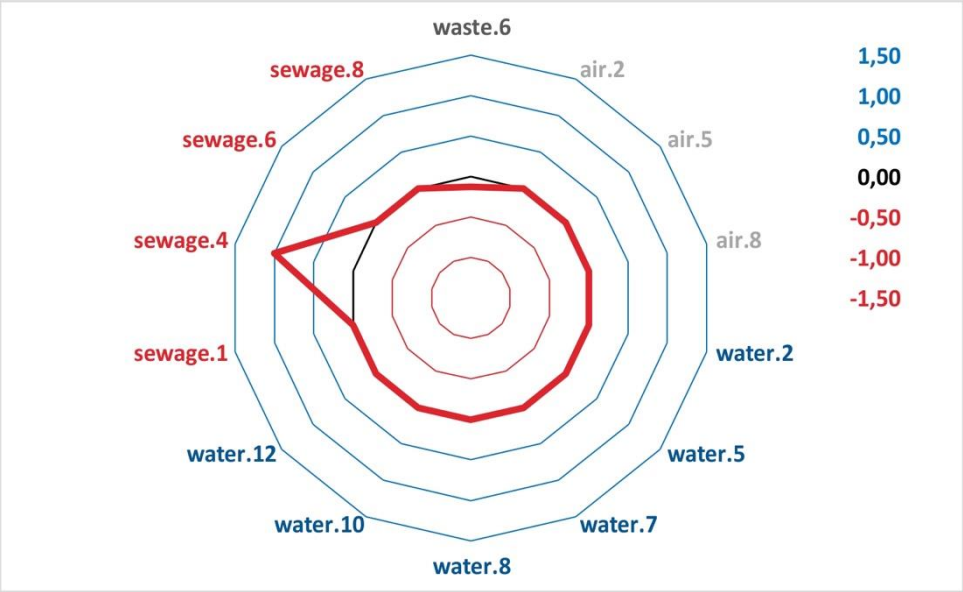


Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

In Poland, the level of competence gaps relating to higher education shows that the educational programmes should place particular emphasis on such learning outcomes as: Organizing and conducting work related to the removal of atmospheric pollution (air.8); Choosing a way to manage waste (waste.6). For the remaining learning outcomes, gaps are minimal or zero, which means that the existing competences of employees correspond to current requirements, as assessed by enterprises.

This does not mean that these learning outcomes need to be omitted from green competence education programmes relevant to the level of higher education, but the level of the gap indicates the current priorities. The data on the green competence profile for higher education in Hungary are presented in Figure 171.

Figure 171: Competency profile at higher education level – Hungary



Source: Own study based on the findings of the survey, n=11; n - number of companies surveyed

In Hungary, the surveyed companies rated highly the level of some of their employees' green competences relevant to higher education. The competence profile indicates that there are zero competence gaps for most of the learning outcomes considered, which means that the level of competence of employees corresponds to the requirements of companies. One of the competences: Ability to manage work related to the construction and operation of sewage treatment plants (sewage.4), is on a positive level - employee competence in this area exceeds the requirements of entrepreneurs.

The only exception is the educational effect of Choosing a way to manage waste (waste.6), whose gap level is slightly below zero. It follows that it is worth putting particular emphasis on this learning outcome in education programmes, but this does not mean that other areas should not be included in education programmes, but they do not have to be given priority.

11.4. Recommendations for lifelong learning

Taking into account the needs of green competencies of Small and Medium Enterprises grouped into 4 areas: waste management, air protection, water management and waste water management, taking into account the specificity of lifelong learning, it can be recommended to "green" the educational programmes in the scope of learning outcomes indicated in Table 40.

Table 40: Competences recommended for lifelong learning

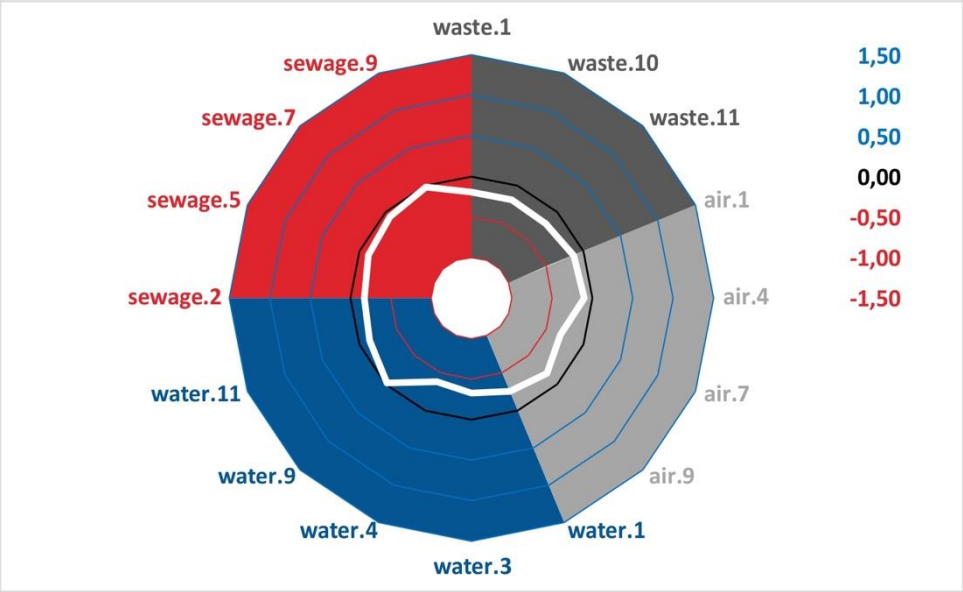
	Competency	Competence profile
	Waste management area	
1	Classifying waste according to specific criteria	waste.1
10	Carrying out work related to hazardous waste management	waste.10
11	Selection of industrial waste disposal methods	waste.11
	Air protection area	
1	Organizing activities related to the monitoring of atmospheric air pollution	air.1
4	Recognizing the source of air pollution	air.4
7	Planning activities related to reducing emissions of air pollutants	air.7
9	Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions	air.9
	Water management area	
1	Development of water management instructions	water.1
3	Choosing water treatment methods	water.3
4	Identifying the source of surface and underground water pollution	water.4
9	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes	water.9
11	Identification of types and arrangements of water supply networks on the company's premises	water.11

	Sewage management area			
2	Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment			sewage.2
5	Selection of devices for the treatment of various types of wastewater			sewage.5
7	Classifying wastewater according to specific criteria			sewage.7
9	Calculation of the degree of pollution reduction in wastewater			sewage.9

Source: Own elaboration on the basis of expert consultations by „competent judges".

Lifelong education may be the appropriate level for shaping green competences in each of the analysed areas (Table 40). However, its role in terms of learning outcomes related to water management is greatest. Lifelong learning may include 5 learning outcomes in the area of water management, 4 in the area of air protection and sewage management and 3 in the area of waste management. These recommendations refer to the category of competence needs of Small and Medium Enterprises, however, without taking into account the state of competence of current employees of enterprises in this area. However, the survey in the whole population of 99 enterprises includes not only questions on required competences, but also about their significance and the assessment of the competences of employees. The answers were to help to identify "COMPETENCE GAPS" defined as the difference between the competence needs and competencies of companies in the green economy. Differences between the degree of relevance and the level of competence were treated as competence gaps and for the entire surveyed population are presented in Tables 30, 31, 32, and 33 respectively for 4 areas: waste management, air protection, water and waste water management. On the basis of this information on competence gaps and after assigning learning outcomes that are optimal for the implementation of lifelong learning, a competence profile of green competences for lifelong learning can be proposed. The profile for the whole surveyed sample of 99 enterprises in 7 countries is presented in Figure 172.

Figure 172: Competency profile at lifelong learning level – all countries



Source: Own study based on the findings of the survey, n=99; n - number of companies surveyed

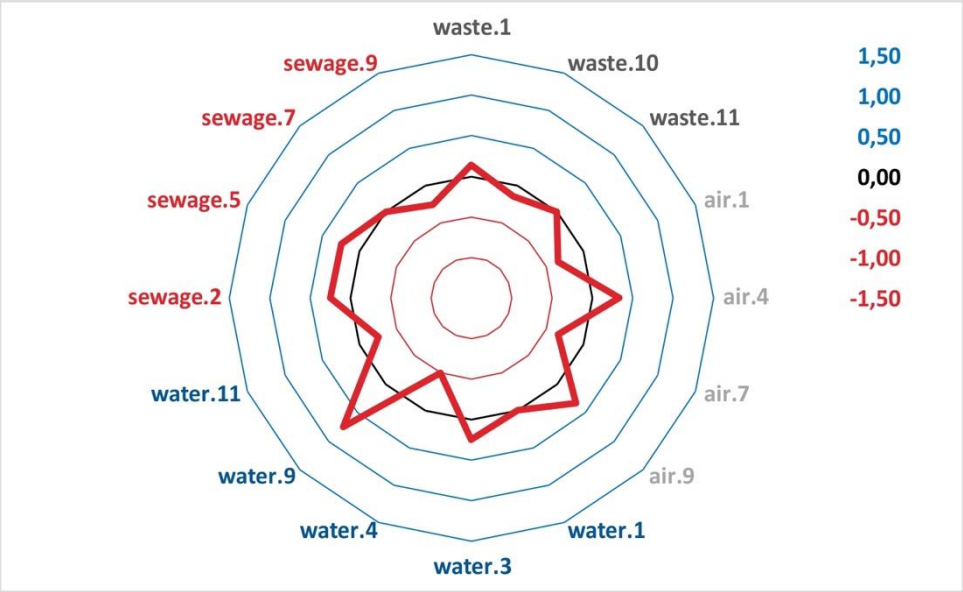
The graph shows that in lifelong learning programmes emphasis should be placed on such effects of green competence education as: Identifying the source of surface and underground water pollution (water.4); Choosing water treatment methods (water.3); Planning activities related to reducing emissions of air pollutants (air.7); Development of water management instructions (water.1).

This does not mean that the remaining learning outcomes of green competencies specific to the level of lifelong learning should be left out of the curriculum, but the level of the gap indicates currently existing priorities.

This average picture of competence gaps relating to green competencies for lifelong learning does not have to be relevant to the situation in individual countries. Therefore, on the basis of surveys of companies in a given country, green competence profiles for lifelong learning have been developed for each country.

The data on the green competence profile for lifelong learning in Austria are presented in Figure 173.

Figure 173: Competency profile at lifelong learning level – Austria



Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

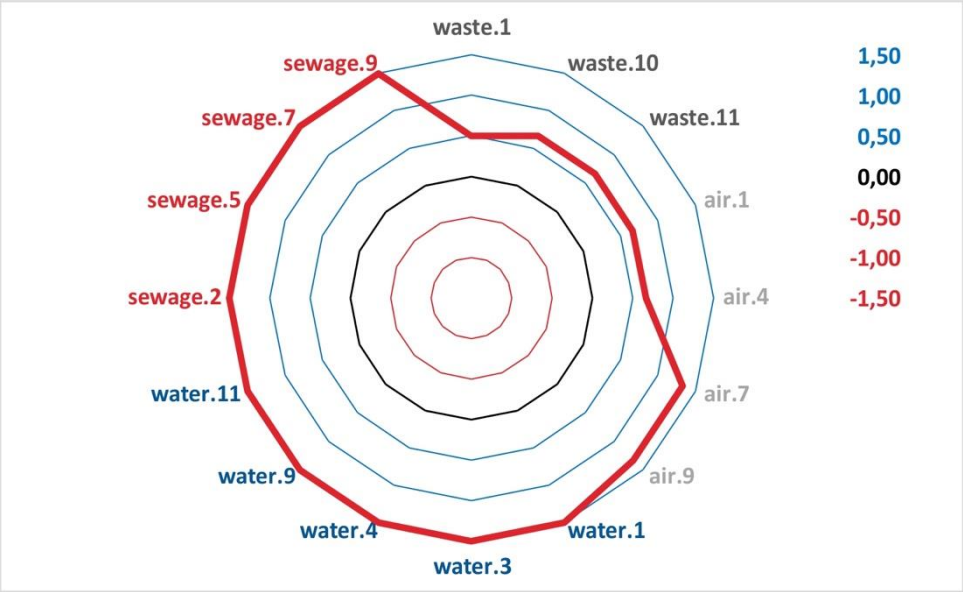
In Austria, the level of competence gaps in relation to lifelong learning shows that educational programmes should place particular emphasis on learning outcomes such as: Identifying the source of surface and underground water pollution (water.4); Organizing activities related to the monitoring of atmospheric air pollution (air.1); Planning activities related to reducing emissions of air pollutants (air.7); Identification of types and arrangements of water supply networks on the company's premises (water.11); Calculation of the degree of pollution reduction in wastewater (sewage.9).

For the other learning outcomes, gaps are minimal or even existing employee competences exceed the current requirements in the assessment of enterprises (gap level is positive). Competence surpluses concern mainly: The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes (water.9); Recognizing the source of air pollution (air.4); Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions (air.9).

The existence of such surplus competences should be viewed positively, but they do not mean that these areas should not be included in education programmes, but they do not have to be a priority.

The data on the green competence profile for lifelong learning in Finland are presented in Figure 174.

Figure 174: Competency profile at lifelong learning level – Finland

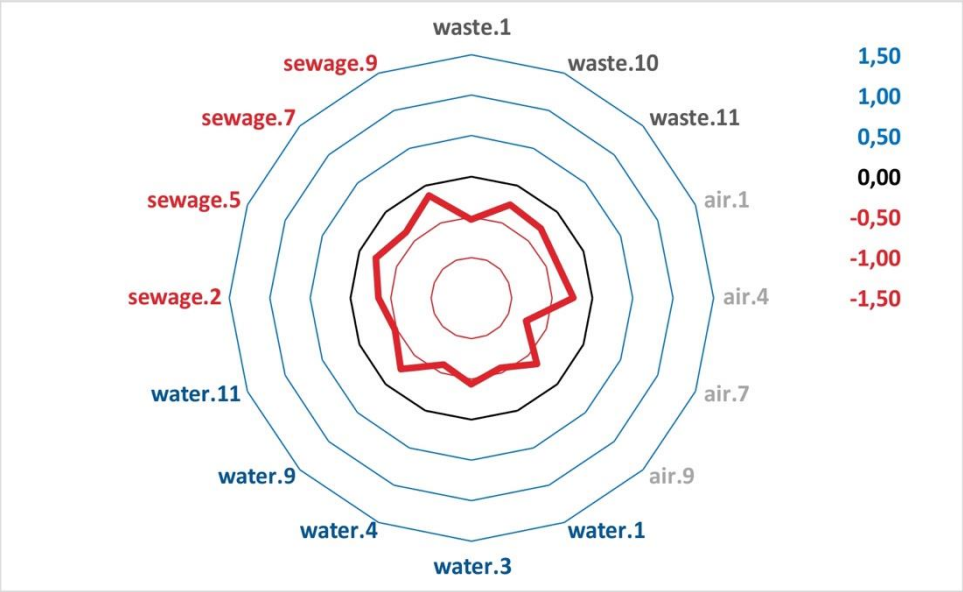


Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

In the case of Finland, the companies surveyed rated very highly the level of employees' green competencies relevant to lifelong learning. The competence profile shows that there are positive competence gaps for all considered learning outcomes and therefore the competence level of employees exceeds the requirements of companies. This may indicate already good educational practices in this country. Nevertheless, it is worthwhile to continue to include all the analysed learning outcomes for lifelong learning in the curricula.

Information on the profile of green competences for lifelong learning in Lithuania is presented in Figure 175.

Figure 175: Competency profile at lifelong learning level – Lithuania

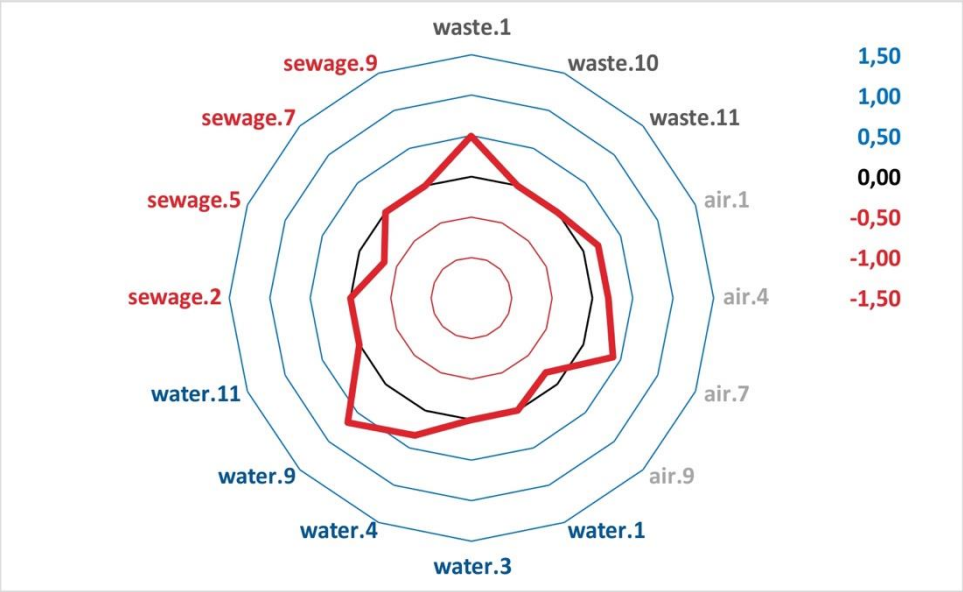


Source: Own study based on the findings of the survey, n=38; n - number of companies surveyed

In Lithuania, from the level of competence gaps relating to lifelong learning, it is clear that the educational programmes should place particular emphasis on such learning outcomes as: Planning activities related to reducing emissions of air pollutants (air.7); Development of water management instructions (water.1); Identifying the source of surface and underground water pollution (water.4); Classifying waste according to specific criteria (waste.1). For other learning outcomes, gaps are minimal, but this does not mean that these areas should not be included in curricula, but only that they do not have to be a priority.

The data on the green competence profile for lifelong learning in Germany are presented in Figure 176.

Figure 176: Competency profile at lifelong learning level – Germany



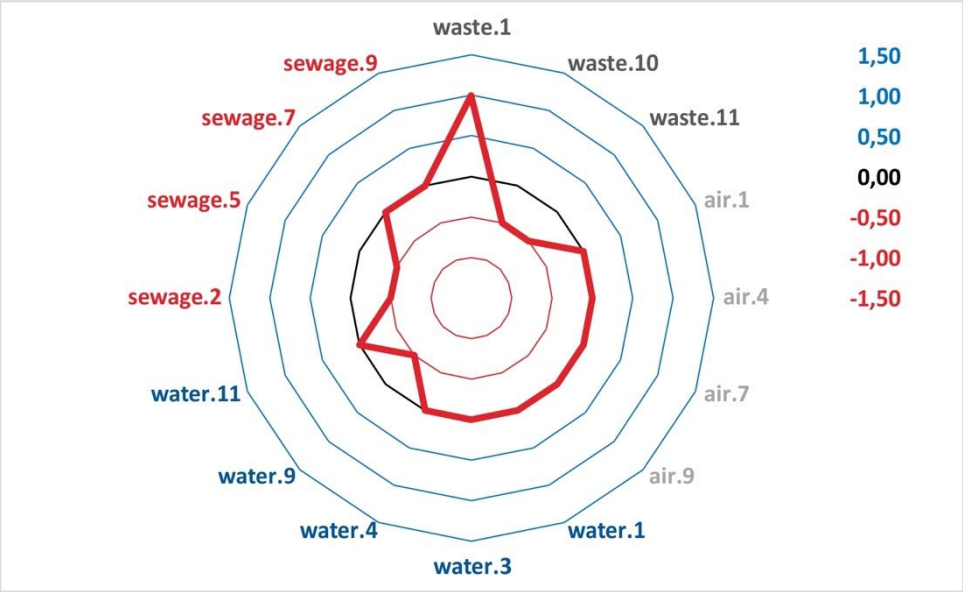
Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

In the case of Germany, the surveyed companies rated rather highly the level of employees' green competencies relevant for lifelong learning. The competence profile indicates that there are zero or positive competence gaps for most of the learning outcomes considered, so that the competence level of employees corresponds to or even exceeds the requirements of the companies. The largest competence surpluses concern: The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes (water.9); Classifying waste according to specific criteria (waste.1); Planning activities related to reducing emissions of air pollutants (air.7); Identifying the source of surface and underground water pollution (water.4).

The exception is: Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions (air.9); Selection of devices for the treatment of various types of wastewater (sewage.5) – in the case of these competences the gap was negative. It follows that it is worth putting particular emphasis on these learning outcomes in education programmes. However, the previously mentioned excesses of competences should be assessed positively, bearing in mind that these areas should also be included in education curricula, but do not have to be prioritised.

Data on the profile of green competences for lifelong learning in Norway are presented in Figure 177.

Figure 177: Competency profile at lifelong learning level – Norway



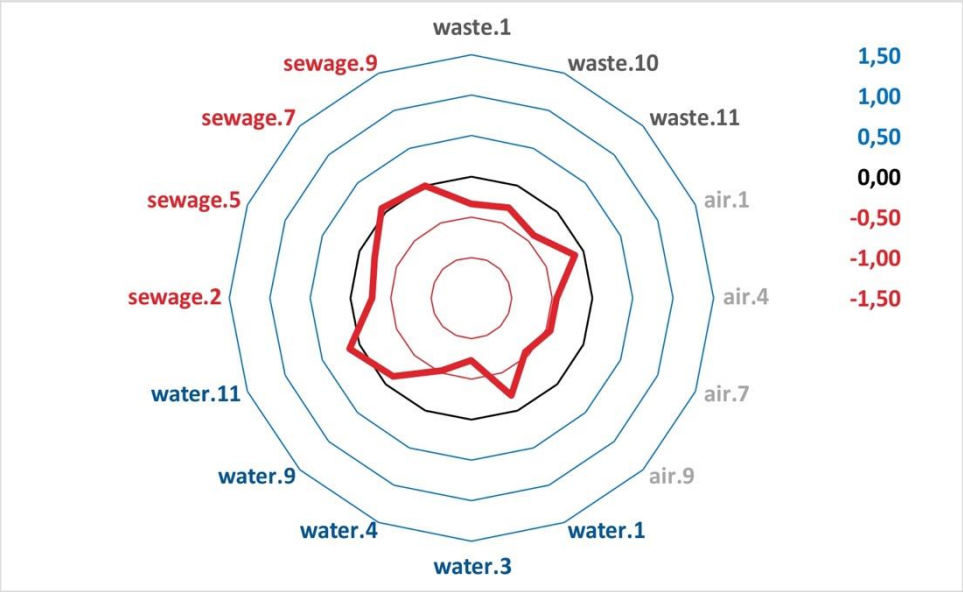
Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

From the level of competence gaps in Norway relating to lifelong learning, it appears that the educational programmes should place particular emphasis on learning outcomes such as: Carrying out work related to hazardous waste management (waste.10); Selection of industrial waste disposal methods (waste.11); The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes (water.9); Ability to assess the quantity and quality of sewage sludge arising and selection of devices for their treatment (sewage.2); Selection of devices for the treatment of various types of wastewater (sewage.5).

For the remaining learning outcomes, the gaps are zero or even in one case exceed the current requirements of employers, so the gap level is positive. The competence gaps concern: Classifying waste according to specific criteria (waste.1).

Information on the profile of green competences for lifelong learning in Poland is presented in Figure 178.

Figure 178: Competency profile at lifelong learning level – Poland



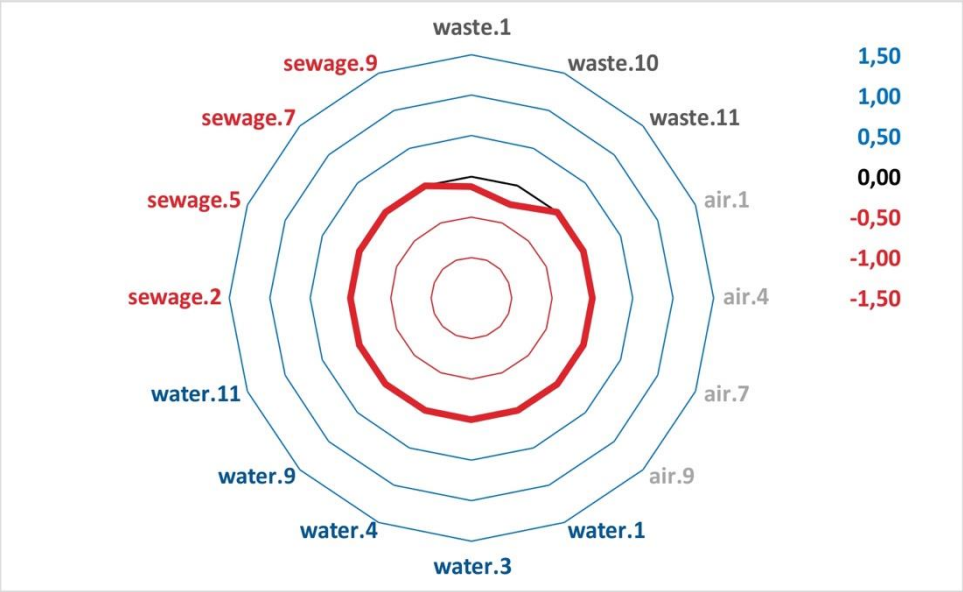
Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

In Poland, the level of competence gaps in relation to lifelong learning shows that in educational programmes it would be beneficial to place particular emphasis on such learning outcomes as: Choosing water treatment methods (water.3); Recognizing the source of air pollution (air.4); Planning activities related to reducing emissions of air pollutants (air.7); Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions (air.9).

For the remaining learning outcomes, gaps are minimal or zero, which means that, in the assessment of enterprises, the existing competences of employees correspond to the current requirements. This does not mean that the remaining learning outcomes of the green competence relevant to the level of lifelong learning should be left out of the curriculum, but the level of the gap indicates current priorities.

The data on the green competence profile for lifelong learning in Hungary are presented in Figure 179.

Figure 179: Competency profile at lifelong learning level – Hungary



Source: Own study based on the findings of the survey, n=11 n - number of companies surveyed

In the case of Hungary, the surveyed companies assessed the level of green competence of employees in lifelong learning as adequate to their needs. The competence profile indicates that there are zero competence gaps for most of the learning outcomes considered and therefore the level of competence of employees corresponds to the requirements of companies. The exception was green competence learning outcomes relating to: Carrying out work related to hazardous waste management (waste.10), Classifying waste according to specific criteria (waste.1), where gaps have proven to be negative and should be highlighted in lifelong learning programmes.

At the same time, this does not mean that the remaining learning outcomes of green competences specific to the level of lifelong learning should be left out of the curriculum, but the level of the gap indicates current priorities.

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