Result 2.2

Report with the results of analyses of skills needs in the green economy

Partner

Hanse-Parlament (Lead Partner), Germany

Satakunta University, Finland, Finland

Tallinn University of Technology, Estonia

Politechnika Gdanska, Poland

Estonian Chamber of Commerce and Industry, Estonia

Pomeranian Chamber of Handicrafts for SMEs, Poland

Berufliche Hochschule Hamburg, Germany

Language

English

Content

1. Summary of the Project and Introduction

The word region is defined as “an area, especially part of a country or the world having definable characteristics but not always fixed boundaries”[1]. The Baltic Sea region (BSR) is particularly unique. While the Baltic Sea is the pivotal point defining much of the region’s characteristics and challenges, the countries are also extremely different. Geographically, they are divided between Northern, Western and Central/Eastern Europe, historically, they have been shaped by the East-West divide after the second world war. Nevertheless, given their proximity to the Baltic Sea, they have much in common.

The EU has acknowledged this by issuing the very first macro-regional strategy, the EU Baltic Sea Region Strategy in 2009. As most countries boarding the Baltic Sea were by then EU member states, it can well be considered the EU’s inland sea. The Baltic Sea Region must address current challenges, such as saving the seas, i.e. ensuring clear water, rich and healthy wildlife and clean and safe shipping. At the same time, there are opportunities for a prosperous region through co-operation measures to increase innovation, to deepen the internal market by improving transport systems, to connect energy markets and to jointly fight cross-border crime. This clearly distinguishes the Baltic Sea Region from other parts of the world.

Therefore, “BSR integration is best understood as the way that European integration has been translated into this region, further deepening and leveraging access to the rest of Europe and the markets that the EU provides”[2]

Over the past 25 years, this region has become a densely integrated, e.g. in the areas of trade, investment, labor mobility, transport and energy infrastructure as well as research collaboration. Furthermore, it demonstrates a broad landscape of robust cross-border organizations and collaborative efforts. Nevertheless, “companies do not look at the Baltic Sea Region as one integrated market in terms of their strategies. For most of them, the region remains a group of individually small markets within the EU, each with its different dynamics, rivals, and often even regulatory rules’”[3].

Keeping this in mind, the lack of comprehensive regional data collection is surprising. Therefore, as part of the Erasmus+ funded project “Promoting permeability through dual bachelor's programs with integrated initial and further vocational training” (BA&VET), an analysis of the region’s demography, economy, and labour as well as education market has been conducted. The majority of the data is taken from the Eurostat database of the European Union. When needed additional sources, such as the OECD database have been consulted as well.

Project summary

[1] Oxford Dictionary
[2] Skilling, David (2018). *The Baltic Sea Economies: Progress and Priorities*. Copenhagen: Baltic Development Forum, p.10.
[3] Ibid., p.11

Objectives: What do you want to achieve by implementing the project?

- Increasing permeability between vocational and higher education
- Recruiting universities for tasks of further education in climate and environ-mental protection
- Providing excellently qualified entrepreneurs, managers and skilled workers and reducing the shortage of skilled workers to meet the challenges in climate and environmental protection
- Strengthening the productivity of SMEs through innovation support and R&D projects
- Promoting cooperation between SMEs and colleges/universities

Implementation: What activities are you going to implement?

- Analyses economy, education and labor markets and qualification needs
- Creation of solution models for 4 project countries
- Development and implementation of Train the Trainer program
- Development and implementation of 2 dual three-stage Bachelor's degree programs and 2 further trainings in climate and environmental protection
- Implementation of R&D projects in SMEs
- Quality assurance for training measures and project implementation
- Dissemination, transfer of results and implementation consultation

Results: What project results and other outcomes do you expect your project to have?

- Result report of the analyses of the economy, education and labour markets and qualification needs
- Solution models for four project countries
- Complete train-the-trainer program
- Module manuals with all documentation for two dual three-stage Bachelor's programs in climate and environmental protection
- Two further education programs in climate and environmental protection
- R&D projects implemented in SMEs
- Quality manual and results reports
- Manual, result videos and broad regional transfer of results

Objectives, results and target groups

The main objectives of the project are as follows:

a) Increasing the permeability between vocational education and training and higher education and thus promoting the attractiveness of vocational education and training

b) Strengthening the recruitment of colleges/universities for the important tasks of continuing education in climate and environmental protection

c) Providing highly qualified entrepreneurs, managers and skilled workers who, in addition to good theoretical knowledge, also have practical competences, skills and professional experience in climate and environmental protection and reducing the shortage of skilled workers to cope with the very large tasks in the energy, climate and environmental sector.

d) Attracting entrepreneurs and executives who have all the skills to successfully run a company and perform high-quality tasks in climate and environmental protection

e) Strengthening the productivity and competitiveness of enterprises through knowledge and technology transfer, promotion of innovation and implementation of manageable R&D projects

f) promoting cooperation between SMEs and colleges/universities, strengthening colleges/universities to implement dual courses of study on climate and environmental protection, and promoting entrepreneurship in higher education.

In pursuit of these objectives, the following results will be achieved:

1. Analysis results on the economy, demography, education and labor markets as well as qualification needs in climate and environmental protection

2. Curriculum. Teaching materials, implementation report and evaluation concept and report for teacher training

Module handbook with integrated continuing education, teaching materials, examination regulations, implementation reports as well as evaluation concept and reports for a three-stage dual Bachelor's degree program

3. "Business Administration & Sustainable Management of SMEs"

4. "Management of renewable building energy technology"

5. Concept for promoting innovation by SMEs and evaluation concept and report

6. R&D projects carried out for SMEs

7. Concepts and report for the evaluation and quality assurance of qualifications and R&D subsidies as well as project implementation, transfer of results, implementations and implementation consultations

The primary target groups of the project are:

a) school leavers who wish to combine vocational education and training with a bachelor's degree and thus receive excellent employment and professional career opportunities.

b) students who are qualified in higher education and university and at the same time in a company and who are highly welcome in SMEs as managers and professionals or as independent entrepreneurs.

c) owners, managers and specialists of SMEs who are qualified in continuing vocational training, acquire tailor-made competences and skills for high-quality activities in climate and environmental protection and achieve a recognized continuing vocational qualification.

d) SMEs that attract suitably qualified young entrepreneurs, managers and specialists, receive innovation funding and carry out R&D projects together with colleges/universities.

The project addresses the following secondary target groups (beneficiaries):

a) colleges and universities which, in order to expand their educational opportunities in climate and environmental protection, receive all the documents and materials for two new dual bachelor's degree programs in order to meet the labor market needs and the conditions of SMEs in particular.

b) chambers and other vocational training institutions which attract strong young people to vocational training, receive curricula for continuing vocational training modules for the qualification of SMEs and their staff, and cooperate intensively with col-leges/universities in teaching and innovation promotion.

c) teachers, advisers and lecturers from chambers, other VET providers and colleges/universities who are qualified in Train the Trainer programs to provide high-quality further training, to carry out dual study courses in cooperation with companies as well as innovation promotion and R&D projects for SMEs at a high-quality level.

Qualification Needs

The analysis of the qualification needs and requirements for the countries of the Baltic Sea Region include:

- All partner countries in the project.
- The countries of the 70 associated partners involved in the project implementation as transfer recipients and implementation partners. Hungary is also included as the only country that does not belong to the Baltic Sea Region, since Hungary, as a long-standing member of the Hanse-Parlament, is an important transfer recipient and implementation partner.

Based on the analyses of the development of the economy, demography, education and labor markets (see Result 2.1 Report on results of analyses of the economy, demography, education and labour markets), the qualification requirements and needs in the Green Economy for SMEs in the Baltic Sea countries were examined as a further basis for the development and implementation of the education measures of the BA&VET project. First of all, statistical documents and literature were analyzed and on this basis conclusions and recommendations for education policy were developed. The results are summarized in chapter 2.

In the framework of another project[4], which was carried out with Erasmus+ funding from 2019 to 2022, comprehensive research and surveys were conducted on the qualification conditions and needs for SMEs in the Baltic Sea countries in the Green Economy. An evaluation and summary of the results of these studies can be found in Chapter 3.

Within the framework of the BA&VET project, the two continuing education courses "Sustainable Management" and "Energy Service Manager" were developed and implemented, which can be completed alternatively within the framework of a dual Bachelor's degree program or as independent continuing education courses with a recognized professional continuing education qualification. Within the framework of the project, the courses are implemented as independent further education courses in the partner countries Poland and Estonia.

In Estonia, qualification as a certified energy consultant (Energy Service Manager) has so far only taken place as part of university degree courses. Brief specific analyses were carried out in Estonia in order to determine the demand and qualification requirements for this qualification as part of further vocational training. The results of these complementary analyses are presented in Chapter 4.

[4] Management and Technologies of Water, Wastewater, Waste and Circular Economy – WWW&CE. Hanse-Parlament, Hamburg 2022

2. Qualification Requirements in Environmental Sectors

Both a shortage of skilled workers and a lack of qualifications are today's challenges, which some sectors are already struggling with (e.g. in the field of electrical engineering and mechanical engineering). Thus, companies are less innovative and competitive than they should and could be. The same reasons are slowing down the transition to the Green Economy. This has been widely discussed in the EU for some time now, especially with a view to achieving environmental objectives. However, what exactly are the qualifications needed to make the transition to an environmentally friendly, low-carbon and resource-efficient economy?[5]

The consensus is that the transition to a Green Economy is changing skill requirements. On the other hand, there are hardly any studies on which occupations are affected and which qualifications are needed. This knowledge is essential in order to respond to changing requirements in green economy and skilled workers shortage at an early stage. So, the authors conclude in a report on a large-scale study commissioned by the Federal Environment Agency in Germany[6].

The study was carried out in Germany, so the conclusions relate primarily to that country. Nevertheless, the results are revealing for the question on the requirements in the green economy. The researchers in the above-mentioned study conducted interviews with interest groups from various sectors of the economy and evaluated job advertisements (nearly 700.000) according to the terms of a keyword catalogue, e. g. “renovation of old buildings”, “bio-shop”, “landscape protection”, “retail trade with food and beverages”[7].

First, they concluded that qualification requirements vary widely. These determine not only the industry the company represents, but also the company's position in the value chain as well as its size. “It is important to note that it is not formal initial training or further training content, but rather skills and competencies that are missing. Moreover, everyone also agreed that there was no need for new training occupations or courses of study. It was more important to make use of existing possibilities. Multipliers such as trainers at vocational schools or training companies play an important role here”[8]. The authors here refer to Mohaupt et al. 2011 or Build Up Skills 2013 (listed in the bibliography).

From the experts interviewed, further and continuing training is well suited to acquiring the skills necessary for the changeover to a new form of economic activity. However, participation in continuing training is still relatively low, especially among small companies. Therefore, corresponding offers should be made more attractive for companies, especially for small and medium-sized enterprises. [9]

The European Centre for the Development of Vocational Training (CEDEFOP) researchers came to a similar conclusion following an analysis of skills needs for greens jobs in six countries: Denmark, Germany, Estonia, Spain, France and UK “the view across all countries is that there are few green occupations per se; the impact of the greening of the economy and

[5] Helmrich, Robert / Schandock, Manuel et. al. (2014): Arbeit und Qualifikation in der Green Economy, in: Umwelt, Innovation, Beschäftigung 03/2014; im Auftrag von Bundesministerium für Umwelt, Naturschutz, Bau und Reaktionssicherheit, p. 10: http://www.umweltbundesamt.de/publikationen/arbeit-qualifikation-in-der-green-economy [accessed July 2019]

[6] Cf. ibid., pp. 10

[7] The researchers carried out guideline-based interviews with representatives of associations and umbrella organisations from the fields of "resource efficiency", "smart cities" and "construction and renovation", "biodiversity and natural capital", "consumption" and "training". They assessed the current situation on the labour market as well as obstacles and future challenges in relation to changing qualification requirements for their thematic focus.

[8] Helmrich, Robert / Schandock, Manuel et. al., pp. 14

[9] Ibid., p. 15

employment mainly takes the form of new green skills within existing occupations. As a result, training is mainly a question of adding green components to existing qualifications or programmes". [10] For example, the insulation of buildings with thermal insulation composite systems has become a focus of painters' activities.

2.1 Overview on SMEs' involvement in environmental sectors

The European Commission uses classification of all economic activities into NACE categories. The following analyses focus on NACE Sector E, which is less prominent in current environmental policy discussions. As the statistical data are available accordingly, the evaluation refers to this classification.[11]

Addressed are SMEs working for third parties in these sectors (e.g. construction, installation, repair and maintenance of equipment) or wishing to implement sector-specific improvements for their own company (e.g. saving water and raw materials, recycling, circular economy).

It must be said in advance that the statistical data include those enterprises whose main business is in the field of water supply, sewerage, waste management and remediation activities. Such small and medium-sized enterprises, which take over individual activities such as installation, repair, service, or consulting in these areas, and actually represent other economic sectors, are not reflected in these figures.

Nevertheless, the statistical data (all data from EUROSTAT) give an important overview of the status quo of the project sector and developments.

Number of companies involved

There were 80.325 enterprises in the water supply, sewerage, waste management and remediation activities across the EU-28 in 2016. Provisional data for 2017 show a decline in the number of companies active in this sector - 79.971. The available data for EU-28 from 2011 (71.580) to 2016 show a steady increase in the number of enterprises in the sector. The provisional data for 2017, which are also the most recent in the EUROSTAT database, show the downward trend for the first time since then.

Turnover or gross premiums written

Although the number of companies, based on the provisional data for 2017, decreased, the turnover continued to increase in EU-28 – EUR 270.362 EUR million in 2017 (in 2016 – it amounted to EUR 256.00 EUR million).

Persons employed

The EU-28 employed 1.6 million people in 2017 (provisional data).

Water supply, sewerage, waste management and remediation enterprises were relatively large on average, accounting for only 0.3 % of the total number of enterprises in the non-financial business economy of the EU-28 in 2016 but accounting for 1.1 % of employment and 1.5 % of value added. Compared to the other NACE sections of the non-financial business economy, the water supply, sanitation, waste management and remediation sector was the

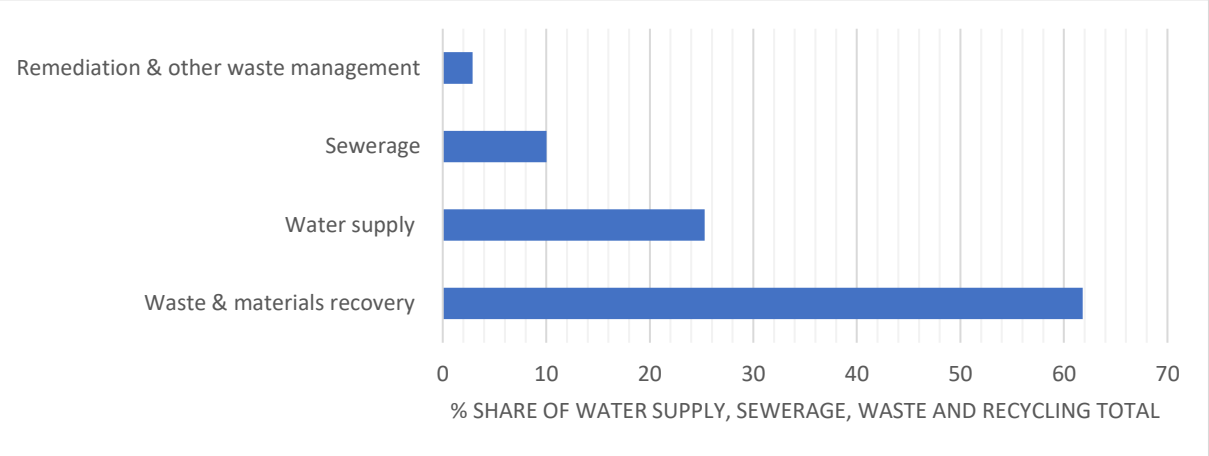
[10] Cedefop (2019). *Skills for green jobs: 2018 update. European synthesis report.* Luxembourg: Publications Office. Cedefop reference series; No 109. http://data.europa.eu/doi/10.2801/750438 [accessed July 2019]

[11] https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Statistical_classification_of_economic_activities_in_the_European_Community_(NACE) [accessed July 2019]

second smallest in 2016 in terms of number of enterprises (0.3 %), the third smallest in terms of value added (1.5 %) and the fourth smallest in terms of persons employed (1.1 %).[12]

In 2017 the waste collection, treatment and disposal activities and materials recovery (Division 38) was the largest subsector in employment terms in EU-28, occupying three-fifths of the sector's workforce. Water collection, treatment and supply (Division 36, hereafter referred to as water supply) contributed to more than one quarter (26.2 %) of the employment, followed by sewerage activities (Division 37) with 10.3 %. This ranking was repeated in value-added terms with 47.8 % for waste and materials recovery, the water supply (Division 36) generated one third (33.0 %) of the value-added, followed by sewerage activities (Division 37) with 17.0 %[13].

Sectoral analysis of employment, water supply sewerage, waste and recycling, EU-27, 2017



SMEs dominate the water supply, sewerage, waste management and remediation activities sector, but these are slightly larger than the average SME in general. The EU-28 wide average was 19.3 persons/enterprise in this sector in 2016. It is generally less dominated by large enterprises (with 250 or more persons employed) than are some other sectors. The number of employed persons per enterprise strongly varies between countries. The table shows data for WWW&CE project countries (Eurostat; own calculation):

Country	Persons per enterprise
Germany	42.9
Lithuania	31.2
Hungary	26.2
Poland	18.3
Austria	9.7
Norway	7.6
Finland	6.5

Large enterprises in the water supply, sewerage, waste management and remediation activities sector still accounted for a larger share of value added (51.9% in 2016), employed

[12] Cf. EUROSTAT Statistics Explained: https://ec.europa.eu/eurostat/statistics-explained/index.php/Water_supply,_sewerage,_waste_management_and_remediation_statistics_-_NACE_Rev._2 [accessed July 2019]
[13] Cf. EUROSTAT Statistics Explained

46.5% of the labour force in the EU-28 and had above average apparent labour productivity (EUR 77 900 per employee) compared to EUR 66 000 per employee in large non-financial business enterprises[14].

Key indicator, Water supply; sewerage, waste management and remediation activities (NACE Section E), EU-28, 2016

	Value
Main indicators	
Number of enterprises (number)	80 325
Number of persons employed (number)	1 550 000
Turnover (EUR million)	256 000
Purchases of goods and services (EUR million)	153 000
Personnel costs (EUR million)	52 300
Value added (EUR million)	108 000
Gross operating surplus (EUR million)	55 000
Share in non-financial business economy total (%)	
Number of enterprises	0.3
Number of persons employed	1.1
Value added	1.5
Derived indicators	
Apparent labour productivity (EUR thousand per head)	70.0
Average personnel costs (EUR thousand per head)	34.7
Wage-adjusted labour productivity (%)	200.0
Gross operating rate (%)	21.6

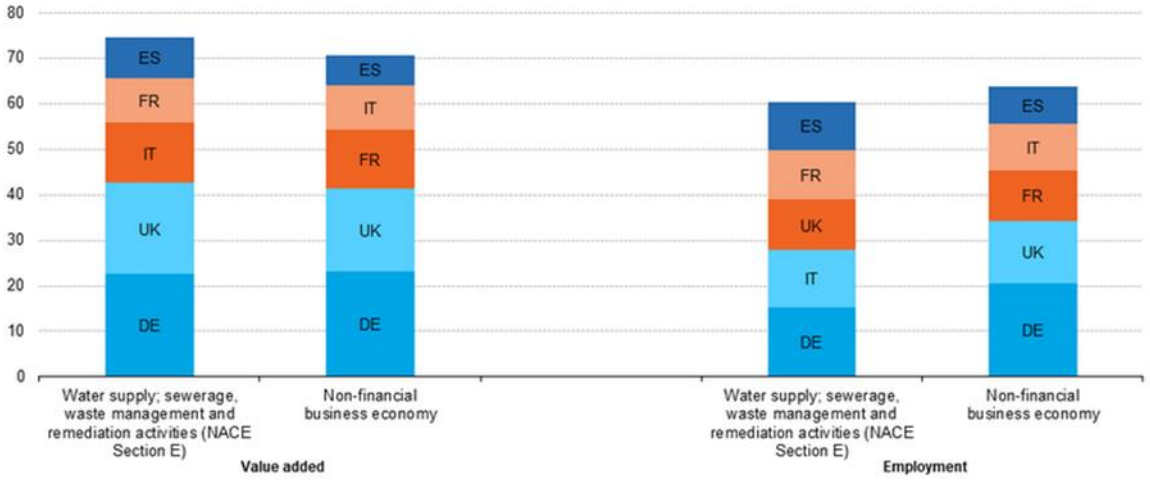
Source: Eurostat (online data code: [sbs_na_ind_r2)

eurostat

Country overview[15]

As with electricity, gas, steam and air conditioning supply, the water supply, sewerage, waste management and remediation activities sector accounted for a relatively large proportion of the non-financial industrial labour force in several EU Member States in Central and Eastern Europe.

Concentration of value added and employment,Water supply; sewerage, waste management and remediation activities (NACE Section E), 2016
(cumulative share of the five principal Member States as a % of the EU-28 total)

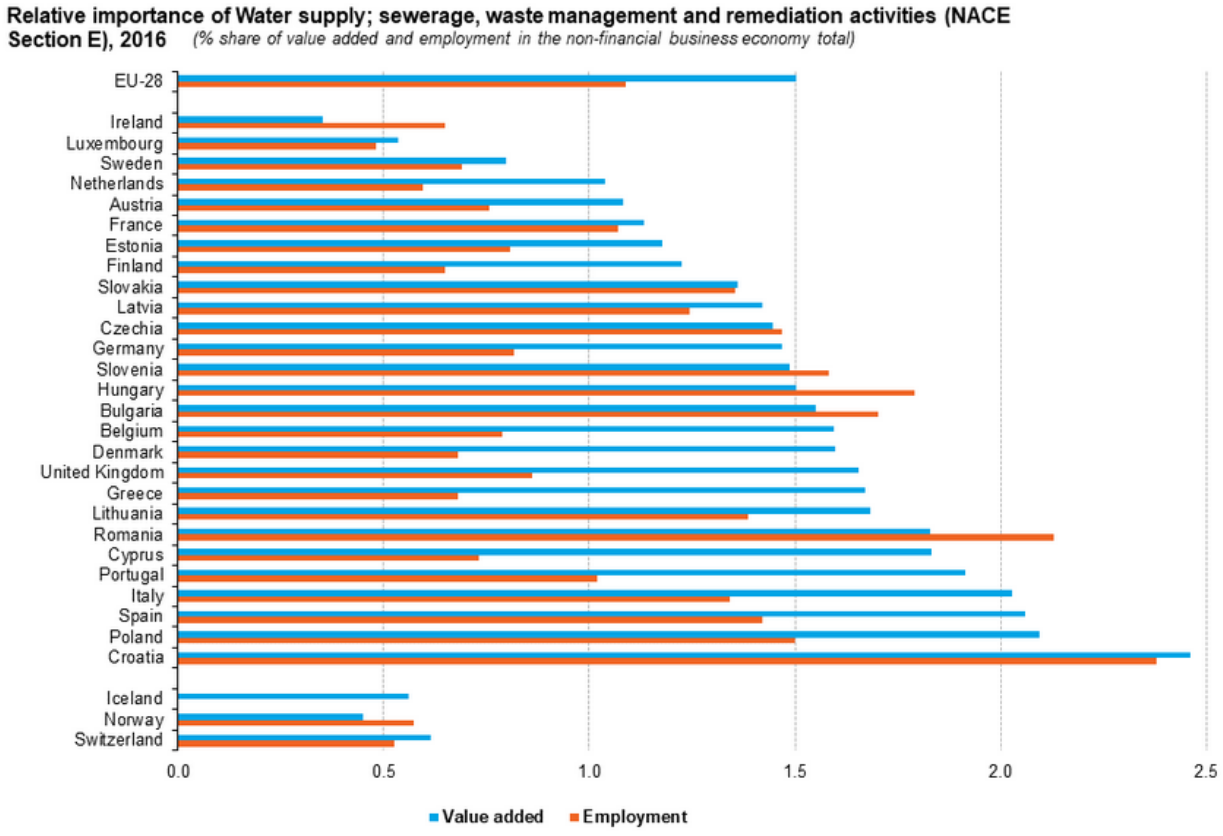


[14] Cf. EUROSTAT Statistics Explained
[15] Cf. EUROSTAT Statistics Explained

In Croatia, Romania, Hungary, Bulgaria, Slovenia, Poland, the Czech Republic, Slovenia and the Czech Republic, the water supply, sanitation, waste management and remediation sector employed 1.5% or more of the non-financial business economy workforce in 2016.

In 2016, the sector accounted for a larger share of non-financial business value added than employment in most Member States, with some exceptions in Bulgaria, the Czech Republic, Ireland, Hungary, Romania and Slovenia, while in France, Luxembourg and Slovakia the respective shares were almost equal.

The water supply, sewerage, waste management and remediation activities sector provided employment to 1.5 % or more of the non-financial business economy workforce in 2016 in Croatia, Romania, Hungary, Bulgaria, Slovenia, Poland and Czechia. The water supply, sewerage, waste management and remediation activities sector accounted for a greater share of non-financial business economy value added than employment in the majority of the Member States in 2016 (see the Figure below).



2.2 Qualification requirements in Green Economy

As part of the Green Jobs Initiative, the ILO Department of Skills and Employability has launched a global research project - 21 countries around the world participated to identify the skills needs of the greener economies. The ILO collaborated with CEDEFOP, whose study with 6 EU countries was included in the results[16].

[16] Cf. Strietska-Ilina, Olga; Hofmann, Christine; Durán Haro, Mercedes; Jeon, Shinyoung, Skills for green jobs: a global view: synthesis report based on 21 country studies; International Labour Office, Skills and Employability Department, Job Creation and Enterprise Development Department. - Geneva: ILO, 2011; pp. 103

The following 21 countries participated in the study: Australia, Denmark, Estonia, France, Germany, Spain, United Kingdom, United States (developed/advanced economies); Brazil, China, Costa Rica, Egypt, Indonesia, Philippines, Republic of Korea, South Africa, Thailand (developing and emerging countries); Bangladesh, Mali and Uganda (least developed countries).

Some findings out of the synthesis report are presented below[17]:

- Environmental protection is about reducing the negative effects of economic activity and increasing the positive effects. This includes a broad spectrum of knowledge and technical, business and conceptual skills. Some of these skills are not green in themselves, but only as green as the context.
- All in all, economies need well-qualified and broadly-based professionals who can apply their skills in different contexts - green or not green. Green jobs need installers, roofers, engineers and chemists with a wide range of technical skills that go far beyond specific sustainability or green skills.

Using the example of the United Kingdom, a list of Green Skills is presented. It is worth noting that this list only includes **technical skills** that are crucial for green jobs. These skills, too, are certainly not "green" in themselves, but are in great demand as the professions become more environmentally friendly.

The checklist contains 10 large groups of skills (Tier 1) that are relevant across industries and are divided into general qualification categories (Tier 2) and more specific skills (Tier 3)[18].

https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Skills_for_green_jobs_global_view_ILO.pdf [accessed August 2019]

[17] Cf. Strietska-Ilina, Olga et.al. Skills for green jobs, pp. 103

[18] The table ist to be find in: Strietska-Ilina, Olga et.al. Skills for green jobs, pp. 103

Tier 1	Tier 2	Tier 3
1. Design skills	Eco-design	Design for disassembly, design for recyclability, design for the environment, design for effective energy use, legislation and regulatory compliance
	Green manufacturing	Legislation and regulatory compliance, integration of process waste
	Materials specification	
	Life-cycle assessment/costing	
2. Waste skills	Waste quantification and monitoring	Waste production calculations, mass balance, waste audit
	Waste process studies	Material/substance flow analysis, resource utilization mapping, life-cycle assessment
	Waste management systems	Objective setting, legislative and regulatory compliance, collection systems, segregation, waste cycle management, 3R implementation (reduce, reuse, recycle), hazardous waste management, landfill requirements, communications/implementation campaigns
	Waste minimization	Industrial symbiosis, integration of process waste
	Waste technologies	Recycling, waste-to-energy
3. Energy skills	Energy minimization	Energy reduction programmes, heat recovery and re-use, energy-efficient technologies, energy-efficient practices, communications/ implementation campaigns, enhanced capital allowance technologies and schemes
	Energy management systems	Objective setting, legislative and regulatory compliance, energy base loads and variable loads, energy audit, energy review, communications/implementation campaigns
	Energy quantification and monitoring	Monitoring targeting and reporting, use of half-hourly data, use of sub-meters, computer-based data logging and energy management systems, energy data manipulation software systems
	Energy costs and trading	Energy markets and pricing, carbon trading schemes, climate change levy agreements, energy price trends, enhanced capital allowances, peak oil and impact on energy supplies and prices
	Renewable energy (RE) technologies	Solar, wind, biomass, combined heat and power, photovoltaic, ground source heat pump, air source heat pump, hydro, hydrogen, fuel cell, integration into energy supply
	Non-renewable technologies	Nuclear, incineration with energy recovery, clean fossil fuel technologies, carbon sequestration, waste-to-energy
4. Water skills	Water use minimization and water re-use	Grey water, water harvesting, wastewater recovery, recycling, cascading, waste/water recovery, effluent treatment, sludge/slurry dewatering, leak detection
	Water management systems	Objective setting, legislative and regulatory compliance, water audit, water consumption review, communications/implementation campaigns
	Water quantification and monitoring	Sub-metering, data collection, water use calculations
5. Buildings skills	Building energy management	Monitoring targeting and reporting, use of half-hourly data, use of sub-meters, computer-based data logging and energy management systems, energy data manipulation software systems, building energy assessment
	Integration of renewable energy	Photovoltaic, solar, wind turbines, combined heat and power, fuel cell
	Energy-efficient construction	Insulation (cavity wall, loft, paperwork), regulatory compliance, passive heating, building regulations
	Facilities management	Building energy management systems, management and maintenance of water, waste management
	Calculating building energy efficiency and carbon ratings	U value calculations, building energy assessment, carbon rating

6. Transport skills	Transport impact minimization technologies	Hybrid vehicles, biodiesel, electric vehicles, fuel-efficient vehicles
	Transport impact minimization processes	Alternative transport strategies, communication/implementation campaigns, car-sharing schemes, public transport planning, public transport implementation, cycle network planning, cycle network implementation, transport modelling
	Transport management in business	Transport modelling, route planning and management, distribution and collection system
7. Materials skills	Sourcing	Sources of low-energy materials, sources of low-mileage materials, recyclates (secondary materials), energy-efficient raw material extraction, industrial symbiosis, transport mileage
	Procurement and selection	Use and properties of low-energy materials and of recyclates, industrial symbiosis, low-carbon and resource-efficient procurement, cost impact of climate change on material procurement
	Material use and impact quantification	Material usage calculations, life-cycle assessment and costing
	Management systems	Material use planning, material flow process design and implementation, energy-efficient process design and implementation
	Impact and use minimization	Life-cycle assessment and costing, energy-efficient process implementation, material flows analysis
8. Financial skills	Investment models	Energy technologies investment models, carbon derivatives investment models, calculation of payback/return on investment
	New/alternative financial models	Carbon trading, EU Emissions Trading Scheme, UK Emissions Trading Scheme, enhanced capital allowances
	Quantification of climate change impacts	Impact assessment of climate change on business finances, impact of climate change on materials availability and cost, carbon neutrality and associated cost/opportunities (costs of doing nothing), risk/opportunity assessment models for adaptation and mitigation, insurance risks/opportunities of a low-carbon economy
	Principles of low-carbon and resource-efficient economies	Polluter pays principle, externalities
	Tools of low-carbon and resource-efficient economies	Climate Change Levy agreements, enhanced capital allowances, cost – benefit analysis, low-carbon and resource-efficient procurement
9. Management skills	Impact assessment	Energy use calculations, water use calculations, waste production calculations, carbon footprinting calculations, emissions measurement
	Business planning	RE planning, low-carbon planning, integration of RE and low carbon into business planning cycles, climate change risks, climate change adaptation and mitigation responses (as part of business risk management), understanding low-carbon and resource efficiency skills requirements and long-term planning
	Awareness raising	Communication/implementation campaigns
	Opportunities management	Identification of low-carbon and resource efficiency opportunities, cost–benefit analysis
	Risk management	Identification of low-carbon and resource scarcity risks, cost–benefit analysis
	Day to day management	Low-carbon and resource-efficient procurement, integration of low-carbon and resource efficiency skills, due diligence, management systems, low-carbon and resource efficiency skills requirements for recruitment
10. Policy and planning skills	Built environment master planning and implementation	Low-carbon spatial planning, zero waste planning, resource-efficient planning, low-carbon and resource-efficient urban design, building regulations, public transport planning and implementation, cycle network planning and implementation
	Strategy development	Impact assessment and modelling, principles of low-carbon and resource efficiency
	Strategy implementation	Understanding of skills needs for HR managers, low-carbon and resource-efficient material sourcing and procurement, awareness raising/communications skills

The list below presents the **core skills** necessary for green jobs identified in the country reports:

- "strategic and leadership skills to enable policymakers and business executives to set the right incentives and create conditions conducive to cleaner production, cleaner transportation etc.;
- adaptability and transferability skills to enable workers to learn and apply the new technologies and processes required to green their jobs;
- environmental awareness and willingness to learn about sustainable development;
- coordination, management and business skills to facilitate holistic and interdisciplinary approaches incorporating economic, social and ecological objectives;
- systems and risk analysis skills to assess, interpret and understand both the need for change and the measures required;
- entrepreneurial skills to seize the opportunities of low-carbon technologies;
- innovation skills to identify opportunities and create new strategies to respond to green challenges;
- communication and negotiation skills to discuss conflicting interests in complex contexts;
- marketing skills to promote greener products and services;
- consulting skills to advise consumers about green solutions and to spread the use of green technologies; and
- networking, IT and language skills to perform in global market"[19].

The country reports show that green transition skills are necessary in all economic sectors and in all industries[20].

Based on the results of the 21 countries, these sectors are among the key sectors for green jobs and will become increasingly important in the future as natural resources become scarcer. In France, for example, almost half of all green jobs are already in this sector (around 400,000 - 450,000). In developed countries, new activities are slowly replacing traditional activities such as the collection and disposal of waste through storage or incineration.

These require a higher level of training because they are more demanding: detection of leaks, quality measurements, flow measurements, closure of circuits or consumer information.

Other new occupations that have emerged in waste management are those of waste prevention manager and recycling industry operators employed by municipalities or waste management companies.

There is a big difference in the recycling industry between the developed and developing countries, namely that in the developed countries this industry is part of the formal economy; in the developing countries, however, it is part of the informal economy, which implies many risks and disadvantages for people working there. For example, the sorting and collection of plastic bags, bottles and other valuable components of waste is mainly carried out by women and children. Many of these jobs often entail health risks and are very poorly paid.

[19] Strietska-Ilina, Olga at. al. Skills for green jobs, pp. 107
[20] Cf. Ibid.

But here, too, the demands on competencies and skills change and become more demanding. For example, separation of organic waste so that it can be used for composting. Other innovative uses of organic waste also require new skills, such as the production of charcoal briquettes from residues of charred cotton, millet, maize and Tiph (a wild herb) stems. A new occupation in developing countries is the recycler of electronic waste.

In Europe, the waste management professions are more complex, each involving several of the tasks that seem to be distributed across different professions in developing countries. State-of-the-art technologies in the sector also determine occupational requirements. For operators in the recycling industry, initial training programmes provide the skills needed to: sort waste, recycle material into raw materials, manage and monitor recycling processes, and maintain machinery and equipment.

In Germany, for example, in 2007 around 55,000 people (of whom only 3 per cent were women) worked in waste disposal and street cleaning: 55.9 per cent of them completed dual vocational training and only 0.7 per cent passed their university entrance diploma.

Environmentally conscious handling of materials not only means recycling, but also considering the composition of the materials themselves. Materials science, and in particular green chemistry, is a growing field in which technological progress is creating new skills. Cleaner and healthier materials would protect consumers from the harmful effects of toxic substances in the products they use; there would be fewer floating, non-biodegradable deposits that would help marine life and make beaches cleaner; and fewer landfills and hazardous landfills would be required. The scientific and technical workforce for this aspect of a green economy needs highly qualified technicians, lab technicians and other staff who can apply the principles of green chemistry in their professions. For example, updating the O*NET taxonomy in the United States lists biochemists as an emerging green profession; other related professions where skills are likely to change include chemical engineers, chemical plant operators and tenderers, chemical plant and system operators, chemical engineers and chemists.

Circular Economy

The promotion of individual environmental sectors such as water, wastewater and waste was also anchored in the “Closing the loop – the EU action plan for the Circular Economy (COM (2015)614final) that proposes actions to support circular economy in each step of the value chain – from production to consumption, repair and remanufacturing, waste management, and secondary raw materials that are fed back in to the economy.

The EU Action Plan for Circular Economy assigned the central role in the circular economy to waste management. The following steps of the value chain are identified and promoted in the circular economy[21]:

1. Production
    a. Production design
    b. Production processes
2. Consumption
3. Waste management

[21] EU ACTION PLAN FOR CIRCULAR ECONOMY https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0614 [accessed August 2019]

4. From waste to resources: boosting the market for secondary raw materials and water reuse
5. Sectoral measures - priority areas
    a. Plastics
    b. Food waste
    c. Critical raw materials
    d. Construction and demolition
    e. Biomass and bio-based products
6. Innovation, investment, and other horizontal measures
7. Monitoring progress towards a circular economy

This action plan was accompanied by numerous concrete measures in the individual defined steps of the circular economy. The first of these began at the end of 2015. These range from the development of guidelines, European standards, proposals, work programmes, programme audits, evaluations of pilot actions, exchange of best practices, initiatives such as "Energy generation from waste" to strategies, e.g. "Strategy for plastics in the environmental service branch", to name a few.

Three years after its adoption, the circular action plan has been completed. The 54 measures have already been implemented, although work on some of them will continue beyond 2019. On 4 March 2019, the European Commission adopted a comprehensive report on the implementation of the Action Plan for the Circular Economy[22]. The report presents the main results of the Action Plan and outlines future challenges for the governance of our economy, paving the way for a climate-neutral circular economy that minimises pressure on natural and freshwater resources and ecosystems.

“The circular economy is now an irreversible, global mega trend”[23]. “Green jobs are seen as a real solution not only to environmental but also to economic and social challenges and offer real income opportunities. Green jobs have become a central part of the political agenda”[24].

However, much remains to be done to intensify action at EU and global level, to fully close the loop and to exploit the competitive advantage it brings to EU businesses. The long-term vision for a prosperous, modern, competitive and climate-neutral economy conceals new markets and market advantages for companies in the European Union, and increases their competitiveness, because "new circular business models, recycling, energy and material efficiency and new consumption patterns have significant potential to reduce global greenhouse gas emissions. Promoting this common approach in companies - including SMEs - and municipalities can simultaneously reduce production costs and support new forms of business interaction such as industrial symbiosis. In addition, circularity and sustainability in the procurement, use and treatment of raw materials (especially critical raw materials) will be crucial to ensure the necessary security of supply, a level playing field for industry and the EU's global leadership in the production of key and low carbon technologies”[25].

[22] Report form the Commission to the European Parliament, the Council, the European Economic ad Social Committee and the Committee of the regions on the implementation of the Circular Economy Action Plan COM(2019)190final. https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1551871195772&uri=CELEX:52019DC0190

[23] COM(2019)190final

[24] Strietska-Ilina, Olga at. al. Skills for green jobs, p. 161

[25] COM(2019)190final

2.3 Conclusion

"Moving towards a greener economy is creating opportunities for new technologies, investment and jobs"[26].

- "Greening jobs goes hand in hand with improving skills"[27].
- Every job can potentially become greener. The understanding of green jobs varies from country to country. Whatever the understanding of green jobs in each country is, however, one must be given meeting the criteria of a decent job - decent wages, secure conditions, workers' rights, social dialogue and social protection[28].
- Improved quality and availability of training can stimulate a positive cycle in which skills development drives innovation, productivity growth and enterprise development, technological progress change, investment, economic diversification and competitiveness - all factors that in turn contribute to the creation of more and better jobs[29].
- Multiskilling requirements seem to be particularly prominent in greener economies.
- Waste and water management, recycling and materials management sectors are key areas for green jobs, which are gaining in importance due to the scarcity of natural resources.

Based on the country studies and statistical data, climate policy developments in Europe, EU-wide measures initiated by the European Commission (e.g. EU-wide ban on single-use plastic items by 2021) and the growing awareness of the climate importance of EU citizens, specialists for greener jobs are in demand as never before. Nowadays there are 3 types of skill changes:

1) creation of new jobs (e. g. waste prevention manager or operators in recycling industries),
2) employment shifts within and across sectors as the consequence of green restructuring,
3) skill requirements are changing within occupations that is the most widespread type of skills change (e. g. the insulation of buildings with thermal insulation composite systems has become a focus of painters' activities).

It will indeed be ubiquitous and will require major efforts to revise existing curricula, qualification standards and training programmes at all levels of education and training.

Adapting training programmes to green changes in the labour market is a cross-cutting task across levels and types of education and training: so far, compulsory and higher education levels have caught up quite well, while technical and vocational education and training are lagging behind in adapting to the needs of the green economy. Improving adaptation can give new impetus to employment-oriented and fair green transitions when mastering further challenges[30].

The used and further relevant references

[26] Strietska-Ilina, Olga at. al. Skills for green jobs, p. 23
[27] Ibid.
[28] Ibid., p. 4
[29] Cf. Ibid.
[30] Cf. Strietska-Ilina, Olga at. al. Skills for green jobs, p. XXV

- Build Up Skills (2013): Initiative zur Ausbildung und Qualifizierung von Arbeitskräften im Bausektor in den Bereichen Energieeffizienz und Erneuerbare Energien. Zusammenfassung. http://www.bauinitiative.de/fileadmin/user_upload/bilder/Dokumente/Zusammenfassungvon-BUILD-UP-Skills-endg-27-02-2013.pdf [accessed August 2019]
- Cedefop (2018): Insights into skill shortages and skill mismatch: learning from Cedefop's European skills and jobs survey. Luxembourg: Publications Office. Cedefop reference series; No 106. http://data.europa.eu/doi/10.2801/645011 [accessed August 2019]

The report calls on policy-makers to adopt a different mindset for tackling skill mismatch, focused on sustainable activation, continuous learning, job-task reengineering and promotion of higher-end product market/managerial practices.

- 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 [accessed August 2019]

In 2010 Cedefop collaborated with the International Labour Organization and reviewed the state of play regarding 'green skills' and 'green jobs' in six EU countries. A European synthesis report built on the six country reports: (Denmark, Germany, Spain, Estonia, France and the UK.

- Circular Economy – Implementation of circular economy action plan

All important documents. https://ec.europa.eu/environment/circular-economy/index_en.htm [accessed August 2019]

- EUROSTAT Statistics Explained: https://ec.europa.eu/eurostat/statistics-explained/index.php/Water_supply,_sewerage,_waste_management_and_remediation_statistics_-_NACE_Rev._2 [accessed July 2019]
- Helmrich, Robert / Manuel Schandock, et. al. (2014): Arbeit und Qualifikation in der Green Economy, in: Umwelt, Innovation, Beschäftigung 03/2014; im Auftrag von Bundesministerium für Umwelt, Naturschutz, Bau und Reaktionssicherheit. http://www.umweltbundesamt.de/publikationen/arbeit-qualifikation-in-der-green-economy [accessed July 2019]
- Mohaupt, Franziska / Konrad, Wilfried et. al. (2011): Beschäftigungswirkungen sowie Ausbildungs- und Qualifizierungsbedarf im Bereich der energetischen Gebäudesanierung in: Reihe "Umwelt, Innovation, Beschäftigung". Berlin/Dessau 2011. https://www.umweltbundesamt.de/sites/default/files/medien/publikation/long/3970.pdf [accessed August 2019]
- Report form the Commission to the European Parliament, the Council, the European Economic ad Social Committee and the Committee of the regions on the implementation of the Circular Economy Action Plan COM(2019)190final. https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1551871195772&uri=CELEX:52019DC0190 [accessed August 2019]
- Strietska-Ilina, Olga; Hofmann, Christine; Durán Haro, Mercedes; Jeon, Shinyoung, Skills for green jobs: a global view: synthesis report based on 21 country studies (2011): International Labour Office, Skills and Employability Department, Job Creation and Enterprise Development Department. - Geneva: ILO.

https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Skills_for_green_jobs_global_view_ILO.pdf [accessed August 2019]

- Skills Forecasts country reports. https://www.cedefop.europa.eu/en/publications-and-resources/country-reports/skills-forecasts [accessed August 2019]

The Skill Forecast country reports summarise the key future trends in jobs and skills for each EU Member State up to 2030. The country reports offer a concise outlook on employment trends by sectors, occupational groups and educational levels as well as developments of on the working age population by age and gender. Implications for future labour market imbalances are drawn when demand and supply are looked upon together.

2.4 Outlook

The current educational system is in a number of countries strongly focused on direct recoverability. It lacks many individual grants and elite education as well as a comprehensive training for all mental, manual and social skills. The education system and also the economy run the risk that the systems will lay off their children and more and more people will not be able to meet the requirements due to the uniformity or leaving existing skills unused and eventually often outsourced. Similarly, the learning skills of stronger learners within the framework of the pronounced elite education experience need to be promoted. In principle, the man should not necessarily adapt to the existing systems. The systems have again become more suitable for a human and understand that every person is a unique human being, and as such deserve promotion and appreciation.

The education sector is often discussed primarily within the framework of structural reforms. Certainly, new educational structures are necessary, but used alone they can bring very little results. But the creation of new structures cannot bring lasting improvement if not preceded by far-reaching cultural reforms. For further development of the cultures almost inevitably, new structures need to be developed.

Early childhood education

The educational policy must focus much more on the children under six years old. Learning begins at a very early age, and it is primarily the central role in the family. All family members, especially the grandparents, should be intensively integrated in a way that adults learn together with the children, e.g. languages. The number of families are growing which are not able ensure appropriate learning at this age at home. The deficiencies at home are forwarded to schools which can barely cope with or compensate these issues. Finally, within the framework of vocational education, enterprises become a repair workshop for families and schools and are less and less ready to meet the changing requirements and increasing cost pressure.

Families need to be strengthened with all the power in all policy areas.

This includes the rediscovery of extended families and the strengthening of the three-generation-families. The development of recent years has resulted in nuclear families. In the three-generation family the grandparents take over the educational responsibilities and relieve the parents particularly on weekdays. In addition, the development of family-like structures and forms of cooperation among not related persons should be supported. The widespread introduction of full-time care ensures that both parents can continue with their career. This will have a positive impact on the declining birth rate, since childlessness is often the choice between family and professional life and in the case of two earners also the financial base is

secured. Among Scandinavian countries this model is implemented largely in Denmark, and it is possible for all children older than one year to attend day care centers.

At kindergartens and schools as a platform for exchange of experiences among each other as well as educators and for further development should be created in the form of a parents- and family- school.

A sufficient number of nurseries and kindergartens are required which do not perceive themselves as mere storage sites, but as early learning and development while playing. Carefree play of the children decides on the future. Playing is for children a serious process which provides pleasure. Also, learning - regardless of the age - should bring joy and make children hungry and not full, has to open instead of closing, awaken curiosity, and provide impulse for continuation, so that all the former students finally find out in their life that there were things of which their teachers had no idea.

The ability of learning by playing needs to be used more actively. Early access to foreign languages is ensured through the introduction of bilingual kindergartens. This simplifies learning further languages and is significant for future close cooperation in the Baltic Sea Region. The highest priority should also embrace the early promotion of languages especially among children whose mother tongue is different, so that language barriers are broken down before the school admission.

An obligatory one-year preschool with smooth transitions into the school system according the linguistic abilities and the standard reached by each individual should be introduced. It would ensure that children from disadvantaged families are supported in early learning and social behavior. Further, it leads to the situation in which children having different mother tongue can master the language of the country before going to school.

The best and best-paid teachers, small group sizes and most attention will be required by the very young and not the older age groups.

School education

Schools should not be an isolated place of learning that is not intensively involved in the social, economic and social environment. The school must be strongly interwoven in decentralized structures, to be a central point of daily life for everyone, sponsorships with companies that include master craftsmen and trainers from the enterprises in the teaching course.

Individual schools and individual teachers in those schools must have a high degree of independence and personal responsibility. On the basis of the total budget, the schools can decide on their own to a considerable extent on the use of their resources. The teaching staff may not be chosen and imposed by superior institutions. The schools also decide on the recruitment and dismissal of teachers. Temporary employment contracts for teachers might be appropriate and gives rise to being aimed at a more intensive exchange between activities at school and in the economy. A performance-based remuneration should be granted.

Teachers are entrusted with the most important thing that a society can have, namely children. Teachers need support, respect and appreciation, and they earn trust. They have the freedom and responsibility to promote children's development and enforcement of their development.

A new pedagogical approach is necessary that requires new qualifications for teachers. Education is a development and qualification task and includes the responsibility of education. Teachers are exemplary trainers who train pupils but also at the same time learn from them.

Transferred knowledge become quickly obsolete. This and the continuing development of pedagogics demand for an intensive further education of teachers.

A holistic education that is created individually and encourages each student according to his personal abilities and talents is required. This requires in particular the need to have distinct diagnostic competence of teachers in order to find out the individual strengths of students and what individual performance objectives can be pursued. These pedagogical elements need to be encompassed with teacher training in a strengthened form and lead to further education. In order to appeal to all senses of students, it is also vital to supply teachers with artistic and manual skills. Every teacher should demonstrate the professional training he or she obtains, which has the form of a dual degree in no way leading to longer training and academic studies.

The school should not give increasingly specialized knowledge, in the case of which growing material abundance requires more feedback. It is important to learn how to learn, how to promote individual strengths and thus strengthen self-confidence. Schools must prepare young people for life, not to a specific occupation. Polytechnic orientations should enable learning through the productive activity, entrepreneurship, independence and promote students' personal responsibility.

The mediation of a broad base of knowledge should be prioritized. A specialization can be taught at secondary schools, studies and during vocational training. The decisive factor is a good mastery of basic cultural techniques: languages, writing, arithmetic, and reading. In addition to the intellectual skills also artistic and manual skills need to be supported. The language is not only the native language, learning at least two foreign languages should be compulsory. They should not teach as an "isolated" subject but rather as language teaching, such as mathematics instruction in English. In addition to the English language, a language from the Baltic Sea Region should be learnt. Enhanced establishment of bilingual schools, especially in border areas, allows attending school in the neighboring country. Along with an expansion of the student exchange between the Baltic Sea Region states, the regional identity will be strengthened, and it will provide the basis for close future cooperation.

General educational school system needs to promote particular personal-social skills. For this purpose, specific subjects are hardly required, because education and learning develop these skills and qualities naturally. Students, who learn in the class together and from each other experience different strengths and weaknesses, develop tolerance, respect and cooperation skills. Individually applied education with specific learning objectives and steps also promotes self-confidence, trust in each other as well as a sense of achievement and motivation. Independent learning in practical action and the required separation in different groups of people promote independence, communication skills, placing in the overall context and mediation of meaning. Through project and group work, students can practice problem solving in a team and are trained in the autonomous learning. Besides the academic achievements by the end of basic education, social behavior will be evaluated.

School/training shall be mandatory until 18 years of age. Following the basic education, all young people shall attend a secondary school or participate in a professional training. School education should not exclude anyone. The high proportion school leavers with no qualifications must be reduced without necessarily reducing level of individual remedial education. The Baltic Sea-wide uniform quality and minimum standards concerning the description of what should be mastered in which class; skills are developed and tested by independent and impartial institutions. This test results should not be used as an evidence for the student or the exclusion criteria, but they should give teachers guidance about where they stand with

their students, while encouraging competition between schools as well as the need to focus on the best and schools learning from one another.

School structures play a secondary role, also in a structured educational system good result can be achieved with the highest permeability. Long learning together is not a prerequisite for good school education, but it facilitates, however, the mediation of personal-social skills of stronger learners and promotes sustainable integration. The success in most of the Baltic Sea Region states suggests rather pursuing the mutual learning as long as possible.

All-day schools should be the norm. This could be done in different models, for example, after the regular lessons from 12.30 pm till 2.00 pm leisure time with common meal and leisure activities and from 2.00 p till 4.00 pm homework supervision and leisure activities, which could have the character of a game, crafts, sports, music or culture and would help to discover personal interests of children, their talents and abilities.

Parents and teenagers can freely choose a certain type of school, a certain professional training or a specific field of study. Children should not be robbed of their childhood. Parents must avoid determining the day's schedule of their children. Children need enough freedom for self-organization, personal discovery of the world, their own individual adventures and gaining experiences. It may not lead to a situation in which children and young people due to a false ambitions or misjudgments in the forms of education and courses of study are pressed to do something every day that is unwelcome and unloved by them. Such young people will continuously collect only negative experiences and failures, lose trust and it would be very difficult for them to entry the professional life.

With all respect for freedom to choose skills, also individual strengths, potential and progress in learning the crossings into further education have a decisive influence. In any case, the choice requires very intensive advice from parents and young people. The overall opening and permeability of the educational system is needed so that everyone can reach their personal potential in accordance with each degree in several ways. Detours will then lead to the optimal way according to the individual possibilities and not to losing time. In this way detours increase the knowledge of the area.

For the crossings into a further training course the following conditions should be applied:

Transition from Kindergarten/preschool to the elementary school: Test on command of the native language and the individual level of development.

Transition from the elementary school to secondary school: Individual schools should determine a level of entrance requirement which needs to be achieved in the elementary school (or in the middle school) as a minimum. The respective minimum levels can be set individually by different schools.

Transition from the school to vocational education: For each profession different levels of achievement and eligibility criteria should be specified, which with the help of competence assessment method and potential analysis would be the basis for the career guidance of students.

Admission to university education: Each admission to university education (whether on the basis of the high school diploma or other rights) should necessarily be dependent on mandatory entrance examination. The level of requirements in the test should be determined by each college/university individually.

Vocational training

Within the framework of school education, it is still necessary to inform students comprehensively concerning the possibilities of vocational training, particular professions, requirements and future opportunities. Close contact with companies and institutions of economic self-management, presentations of companies, masters and trainers facilitate the information and identification process. Recurring internships and experience in entrepreneurial skills should be mandatory for all students.

The guidance requires significant intensification. This should be addressed not only in formal entry requirements and conditions such as school degree and grades. More important is the development of job-specific competency profiles, which are then compared with the carefully identified individual skills of each young person. Also, a careful consultation and preparation for vocational training must achieve a significant reduction of too high ratios of exchanges and dropouts in professional training.

Different levels of performance and eligibility criteria should be set for the whole Baltic Sea Region as a basis for individual competence assessment and analysis of potential and then approved to be transparent. These criteria help trainers and trainees, and the companies to get employees who are ready for the performance of the task and develop a sense of achievement in the case of young people who can be thus motivated for further work. The high number of dropouts and the risk of dead-end jobs will be significantly reduced. Vocational training must adequately take into account individual skills and capabilities and require extensive differentiation. Through the introduction of different levels, young people from different educational backgrounds, with different competences and learning progress can have an opportunity to obtain education which matches their specific skills:

Level 1: Specific vocational training for learners with learning difficulties for a period of 2 years, enabling focused and practical learning, will be completed with an independent recognized qualification.

Level 2: Middle-level vocational training with theory and practice parts for a period of 3 years and a recognized qualification as a skilled worker or journeyman.

Level 3: Advanced vocational training courses for the study of skills with a duration of 3 - 3,5 years, which provide additional qualifications or training preferable in the initial training and which will be completed with recognized degrees above the present trade or journeyman's examination.

With such a differentiated system of professional training, high permeability is needed. Each graduate at a lower level needs to have an unlimited possibility to reach a higher level, according to their progress in learning and actual achievements; taking into account already completed parts of the training. And vice versa, there should be an exchange of courses of a higher level to a lower-level courses taking into account the already covered training periods.

In an open and transparent system gradual learning according to individual skills and potential is realized in every respect. Depending on the learning achievements and developments, each individual can achieve in principle the completion of education and training, although in different ways.

Also, in vocational training every young person deserves a second chance. This requires specific actions of preparation and support which need to be developed and implemented in close co-operation with enterprises, inter-company training workshops and vocational schools.

Vocational training should preferably ensue in the dual system which combines practical training in the enterprises with accompanying theoretical courses in vocational schools and ends with a recognized vocational education degree. For school-based vocational training, practical learning activities under field conditions and corporate learning times should include at least 50% of the total training time. The mediation of theory should be possible alongside the practical training. In the case of larger theoretical issues which require related presentation, longer teaching blocks can be chosen to provide theoretical training to a certain extent.

The teaching of the theory (vocational schools) and practice (companies) requires close coordination and integration of both. Vocational schools also in this case have to prove that they have a very high degree of responsibility and flexibility and the content as well as the presentation forms (block or day classes, block lengths, project work, etc.) should be designed in a way specific for a given profession and in cooperation with enterprises. Vocational schools should be supported with financing from public funds of the economic self-government; in doing so, intensive contacts to enterprises will be made resulting in cost-reduction and concurrent increase of quality. If a sponsorship of vocational schools by economic self-administration is not feasible, enterprises or their representatives of the economic self-governance have at least to be involved in an instrumental way in the design and implementation of the tasks of vocational schools.

Vocational education must qualify for the future requirements of labor force. The superiority of the dual system is based – among others – on the fact that large parts of the education take place in the enterprises. Thus, there is a permanent orientation towards the actual and future economic challenges. Accordingly, school-based vocational training requires intensive contacts with enterprises. The teachers in vocational schools must cooperate intensively with the industry and should do internships in enterprises on a regular basis as well as realise intensive further education.

An internship abroad already during the studies needs to be further supported. In addition to the general broadening of international experience, gathered intercultural competence is strengthened, contacts are made, and work methods and practices are learned abroad. Parts of the training acquired abroad, and the periods of learning must be fully recognised for the vocational training in their home country.

The vocational qualifications of all the three levels must be proven in national examinations. On this basis, the system of professional training and the examinations will be transferred in the entire Baltic Sea area, just as a sovereign function of the chambers as responsible institution for vocational education. The acquired qualifications require mutual recognition in the Baltic Sea Region states.

For this purpose, the development of the European Qualifications Framework (EQF) and a European system of credit points is conducted. These approaches are based on transparency and mutual trust. The focus is on the qualifications of skills of stronger learners and learning outcomes. When implementation it is particularly important to provide non-bureaucratic systems, which would document acquired skills and competencies by certificates of the international recognition and equality, encourage continuous learning, facilitate education and activities abroad and to motivate as well as facilitate the enterprises which are liable for their personnel decisions, provide information and transparency. The chambers in the Baltic Sea Region can - on a solid basis of trust - perform the implementation of non-bureaucratic systems and a full introduction of a pioneering role and so reach innovation projections.

Not only the formal learning and knowledge, but also informal learning and skills of stronger learners acquired during training are crucial for a high level of qualification. They should

therefore be documented in certificates, as well as assessments of enterprises and self-assessments. The Euro-Pass constitutes an orientational basis, which encompasses personal skills, competencies and recognized qualifications; it can be completed on the basis of the demand and should receive intensive support from the partners from the Baltic Sea Region.

The measures outlined above can also serve to enhance and increase attractiveness of the vocational education. In order to achieve these objectives complete outstanding permeability between vocational and higher education with recognition of competencies acquired earlier is needed. A Vocational degree including professional activity of 2 - 3 years should entitle to higher university education in all the Baltic Sea Region states.

Furthermore, all measures of quality improvement and assurance taken in the professional training and comprehensive information and image campaigns need to be conducted. In this context, it is also necessary to highlight and clarify the immense nature of general education and vocational training, which demonstrates that particularly within vocational education new elite of responsibility, is created and an elite promotion of achievement of all sorts of educational attainments and professional activities needs to be implemented.

Young people and their parents must be aware that facing the large and increasing proportion of university graduates professionals and managers who have completed vocational training as the most limited factor and therefore in comparison to many academic degrees they have the best future prospects. However, vocational training may not lead to dead ends, but must be justified in an open and totally transparent system of continuous further education and university qualifications.

Further vocational education and studies

Vocational training does not require government regulation and should be primarily the responsibility of the industry and its local administration. Employers and employees need to recognize much greater extent of the high and growing importance of training and heavily invest in it. In this context, new models of burden sharing should be developed, in which for example the enterprises bear the cost of the training, and the employees can have their leisure time.

However, in general vocational training requires intensive professional development and in particular some improvements. This includes various approaches, for example:

- Systematic development of certified training modules that can be combined and lead to accredited training qualifications.
- Creation of training professions and professional development of horizontal career paths.
- Establishment of equality of educational pathways and degrees of vocational, general and university education.
- Full permeability and enhanced links between vocational education, further training, and general education, and in particular university education. Vocational training needs to be taken into account in relevant disciplines of study.
- Promotion of international exchange, implementation of professional activities and training abroad, while making the greatest possible transparency of the acquired skills.
- International recognition or equivalence of further education qualifications in the context of non-bureaucratic systems.

According to the regulation in Germany, the chambers in all Baltic Sea Region countries should maintain the authority of sovereign functions. The chambers should be able to issue

official examination regulations with recognized degrees of further education programs (so called Chamber examination). Solely the chambers should be responsible for the examinations in further education programs.

The Qualification for Master Craftsmen has proved to be very successful. This qualification secures the theoretical and practical knowledge and skills of junior employees and managers. The Qualification for Master Craftsmen is essential for small and medium sized enterprises; it must be intensified and coherently provided in the entire Baltic Sea area. The Qualification for Master Craftsmen must entitle to start academic studies. The obtained qualification during the Master Craftsmen must be considered comprehensively for the study courses. It seems to be appropriate that achievements in the Qualification for Master Craftsmen will also be evaluated with Credit Points, which can then be considered for the study program. This creation of permeability will sustainably increase the attractiveness of vocational education in general and that of the Qualification for Master Craftsmen in particular. Any opening of the education systems with various educational carriers will satisfy individual affinities and abilities. Furthermore, it provides an opportunity for enterprises to meet the increased demand for skilled workers. It corresponds to the dire necessity that employees from outside the profession can work in craft-based industries and small- and medium sized enterprises.

Bachelor courses should be much more practice-oriented and offered as a dual system. So, studying at the university would be linked to vocational training or practical work in enterprises. Vocational training is completed with a separate degree and in a certain scope would lead also to credit points which are required for passing the Bachelor examination. Dual study programs could be combined with the Qualification for Master Craftsmen. The achieved credit points must be taken into account completely for the Bachelor exam.

Within the framework of dual courses of studies, each student should be obliged to complete a part of their studies or vocational training abroad. Hereby, the focus should be laid on vocational training or employment in a foreign enterprise, since this at the same time allows making contacts between enterprises.

Colleges and universities need to cooperate in teaching and research much more closely with small and medium-sized enterprises. Dual degree programs can significantly contribute to meet the high and growing demand of young entrepreneurs, managers and of professionals in the future who have both practical and sound theoretical training. This training partnership between enterprises as well as colleges and universities is also an ideal starting point to knowledge sharing, technology transfer and implementation of practice-related research and development work.

Educational and regional economic policy

Further decrease in transport and communication costs increases the mobility of production factors. Enterprises migrate to locations with high potential of professionals and workers, to locations with attractive educational opportunities and diverse labor market.

The local competition for (highly) skilled workers and capital is as a result more intense.

Education programs are a key competitive factor. Education policy, therefore, enhances to a large extent the overall location, regional and spatial planning policy.

Education promotes innovation and competitiveness and includes the main support task for small and medium enterprises. Education policy must be organized and have the highest priority over other types of policies. Understood in this way Baltic-wide concerted education policy must:

- increase the competitiveness of the entire Baltic Sea Region.
- promote and develop human capital and the existing advantages and strengths.
- specifically develop individual sub-regions, and optimally support the competition between locations within the Baltic Sea Region in order to support the best educational opportunities and qualified professionals.
- together with the overall attractiveness and competitiveness of the Baltic Sea Region compared with other regions, increase migration of workers and enterprises.
- be enshrined in the EU Baltic Sea strategy and have priority.

Politics, economy and society of the Baltic Sea Region must address their outstanding position of education policy and it is necessary to recognize that the investment in human capital is the safest and brings the best profits.

The German system of dual vocational education, which leads to a comparatively low youth unemployment, integrates enterprises in the task of ensuring the influx of junior staff, as well as combines the requirements of the labor market with the enterprises in a much better way, can provide large contributions to the achievement of objectives with a lasting impact.

The introduction of dual systems of vocational education is the most innovative in the countries with school-based vocational education. This is connected with far-reaching reforms and extensive changes, which constitute a major challenge to these countries. The involved countries are in principle interested to implement dual vocational training; however, they are afraid of great expenses and risks connected with the conversion.

It is also impossible to simply transfer the existing dual systems (e.g. from Germany). It is rather necessary to consider the regional conditions, political conditions, cultural differences, experience, etc., as well as lead to appropriate changes and adjustments, and implement customized solutions which comply with the basic principles of dual vocational education.

In some countries, up to 15 – 20% of school graduates cannot start their professional education, since they lack general education knowledge and/or there are problems in social behavior. This also includes a significant proportion of young people who cannot start their vocational education immediately despite the acquired training maturity. These young people wait in long queues or receive no vocational training, and as a result are prone to face unemployment.

Up to 30% of young people, who complete vocational education, break it up; only about a half of them begin a new vocational education course. A substantial proportion of dropouts fail in theoretical parts of education. The central reasons for this are that the academic knowledge for the selected profession is not sufficient; the career choice made does not correspond with the actual tendencies or competences due to the absence of relevant information and experience or problems or personal and social behaviors.

The vocational education has lost much of its attractiveness. Especially in the new countries of the EU (e.g. Poland, Lithuania, Latvia, and Estonia) with primarily school-based vocational education, the training participation is low, dropped to an alarmingly low level, and is perceived as a dead end by many young people. In a few countries (e.g. in Lithuania) only one- or two-year programs are carried out in the school-based vocational education, which open a faster entry to the labor market with a higher earning potential, however, they do not qualify in a sufficient way and increase the unemployment of young people on an ongoing basis. Only short internships take place in enterprises, so that work-based learning is conducted to a very limited extent. The consequence is the unemployment of 15 – 24-year-olds at the level of 28 – 30% in Lithuania, Latvia, and Poland. Insufficient professional qualification leads to

long-term unemployment which amounts to e.g. 20% in Poland, 28% in Latvia, and 40% in Lithuania for persons with only primary and lower secondary education.

At the same time, companies complain about the lack of skills of graduates. School-based vocational education can consider the conditions of the labor market and the qualification requirements of enterprises only to a very limited extent, since there are few aligning mechanisms between the number of training places and the development of the demand of workplaces. In the case of school-based education, there is little contact between schools and enterprises, so that the qualification requirements of enterprises can be included in the training only inadequately. The students learn the everyday business life only in a very limited way, are not sufficiently involved as interns in the company's operations, and the increasingly important personal and social competences can be taught in the classroom only to a limited extent. After a survey conducted in enterprises by the Baltic Sea Academy in Lithuania, 70% of SMEs require additional skilled employees who are very difficult to acquire. 96% of SMEs require a better practical training, and 74% a better theoretical training.

Because of the demographic change, the number of school leavers in all Baltic States has dropped significantly, with the exception of Sweden. By 2030, the number of the working population aged 15 – 44 will decrease by 25%. Already today there is a shortage of skilled workers in most countries, which will have an even stronger effect in the future and will strikingly limit the developments. Simultaneously, we can observe shockingly high youth unemployment, in particular due to the lack/shortage of vocational qualification.

SMEs threaten to be a loser in the competition for qualified young employees. Due to a lack of qualified staff, innovations in SMEs are much smaller than they actually should and could be. The shortage of young entrepreneurs, managers, and professionals, as well as significant skill gaps is the factors which limit the growth of SMEs the most. The increase in the qualifications with the simultaneous elimination of the shortage of skilled workers is the most important promotional task and the central key to sustainable strengthening of innovations, competitiveness, and growth of SMEs in the Baltic Sea Region.

Given this, it is of crucial importance to

a) prioritize the integration of young people and reduction of youth unemployment as well as

b) the provision of qualified employees to SMEs and a significant reduction of the shortage of entrepreneurs and of skilled workers.

In dual vocational training, about 70 – 75 % of the total training time is spent in the company. This inevitably means that in the case of a transition from school-based into dual vocational education, personnel and spatial capacities are released. The fear of losing a job is a large inhibiting factor for appropriate reforms. It is necessary to develop new areas of activity for vocational schools; continuing education for example is offered, for which there is a large demand in the majority of Baltic States and so far, the supply has been very limited. Vocational schools must therefore be developed into regional education and innovation centers that are jointly supported by chambers, vocational schools and universities and all tasks from the transition of the general in vocational education, vocational education and training up to dual bachelor's degree programs.

3. Green Competences in Small and Medium Enterprises in Europe

Bialystok Foundation for Professional Training, Poland, completed a comprehensive study on environmental competence needs in SMEs in the Baltic Sea Region in 2022[31]. The results of these analyses and interviews are summarized below.

3.1 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 prioritizes 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[32]. 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 specialized 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[33]. It may be argued that correct environmental management may become an important source of competitiveness. For example, E. Mazur-Wierzbicka lists three aspects of economic benefits for a company related to care for environmental matters[34]:

Cost efficiency resulting from rational resource and energy management;

[31] Green Competences in Small and Medium Enterprises in Europe. Study report on environmental competence needs in SMEs, Bialystok Foundation for Professional Training, 2022

[32] Strategia Edukacji dla Zrównoważonego Rozwoju, Europejska Komisja Gospodarcza ONZ, Warszawa 2008.

[33] 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

[34] 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.

Changes in the way how work is organized in a company and its organizational 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[35]. 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[36].

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[37].

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 relationships between the various components of the environment, and minimise ecological risk[38]. 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,

[35] M. Krawczyk, *Konkurencyjność przedsiębiorstw w świetle uwarunkowań ekologicznych*, Zachodniopomorska Szkoła Biznesu w Szczecinie, Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzanie nr 25

[36] Ibid.

[37] Ibid.

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

designing and utilizing 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 organizations 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.

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*[39]. 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.

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

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 organizations 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 organizations which want to systematically manage its environmental obligations, which contribute to the environmental pillar of sustainability. The standard facilitates organizations' achievement of established environmental management results, which add value to the environment, the organizations and their stakeholders. According to organizational environmental policies, the established results of environmental management systems include[40]:

improvement of the environmental effects of activity;

fulfilment of compliance obligations;

achievement of environmental obligations.

The standard maybe implemented by any organization, irrespective of its size, scope, and character. Also, the standard is applicable to those aspects of environmental activities, products, and services, which the organization defines as under its supervision or impact across its life cycle. The process of identifying 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 (BAT-NEEC) 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 organization'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 organizations (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 organization. It is worth noting that while ISO 14001 is an important component of EMAS, the Eco Management and Audit Scheme utilizes 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 minimizing their possible effects by emergency procedures). It also provides the possibility of documenting that the activity is conducted in

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

accordance with the law which further increases reliability among clients, investors, administrative authorities, and supervisory bodies[41].

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[42].

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 and 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

[41] 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]

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

courses on logistics, as well as the ongoing need for continuous education of employees in this field.

Environmental organisations are gaining a stronger position across Europe. Such organisation gains 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 favorable, individual decisions,

crisis management,

investor relations 0 maintaining contact with shareholders and other members of the financial community,

cooperation with donors and non-profit organizations - aimed at obtaining financial or voluntary support[43].

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 results 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.

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[44]. The research was then repeated in 2017 and a new report was published in 2018[45]. 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

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

[44] 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].

[45] 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].

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 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 policymaking 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[46]:

[46] 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]

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
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:[47]:

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 programs in environmental technology, and energy technology and planning, along with two-year master programs in water and environment, and environmental and natural resource economics. In France, the vocational licenses (level II, *License professionnelle*) launched by universities on the basis of identified skill needs include new licenses such as *Eco-design*. Data collected in France shed light on the types of programs recently developed. Between 2008 and 2011, 100 vocational bachelor's 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 programs, especially in nature protection and the

[47] 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]

prevention and reduction of pollution[48]. 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 [49]. 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[50]. 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.

[48] 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)

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

[50] 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 e	2,2
Energy efficiency of production processes	2,7
Methods to minimize 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.

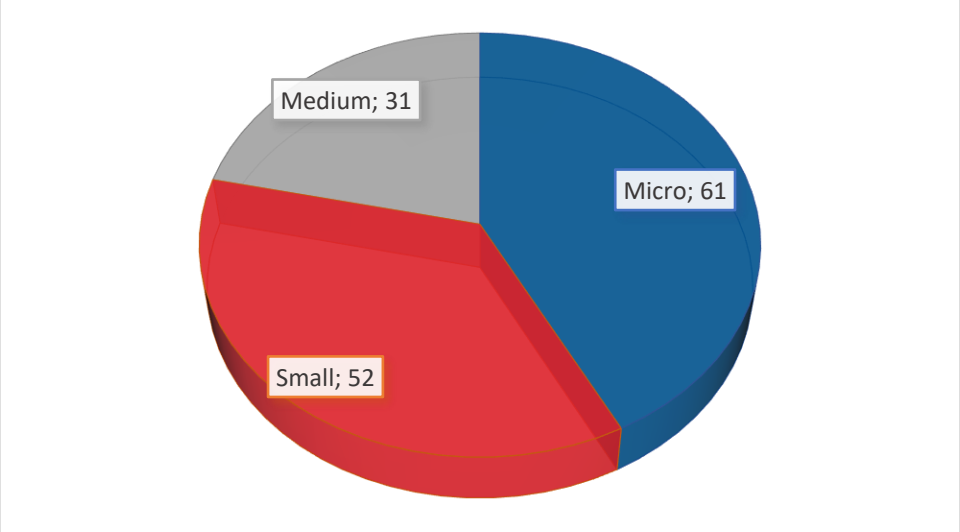
The approach presented should be considered as an important step forward in understanding the eco-competence needs of SMEs. However, its limitations are worth noting. First of all, as assumed by the authors themselves, the model of the competence profile and consequently the training program refer to 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 programs, 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.

3.2 Results of quantitative studies on environmental management needs

A total of 145 companies operating in Austria, Finland, Germany, Lithuania, Hungary, Norway and Poland took part in the survey. The largest number of them, 61 of which were micro-enterprises, 52 belonged to the category of small enterprises and the remaining 31 were medium enterprises (Figure 138).

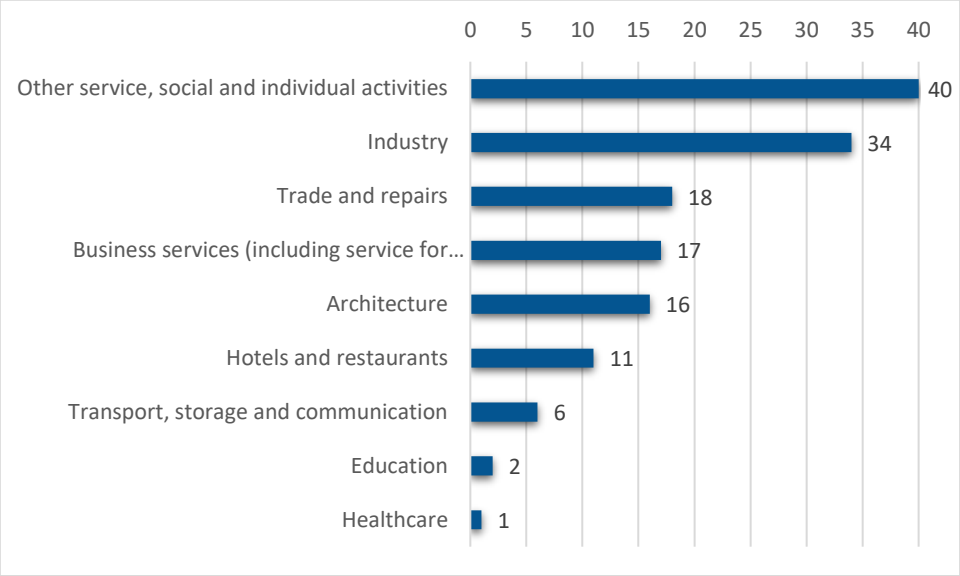
Figure 1: Company size – all countries



Source: Own study based on the findings of the survey, n=145; n - number of companies surveyed

The largest number of enterprises subject to analysis operates in service, social and individual activities (40 companies), industry (34 companies), trade and repair (18 companies), business services (17 companies), architecture (16 companies), hotel and catering (11 companies), transport, warehouse management and communications (6 companies), education (2 company) and healthcare (1 company) - Figure 139.

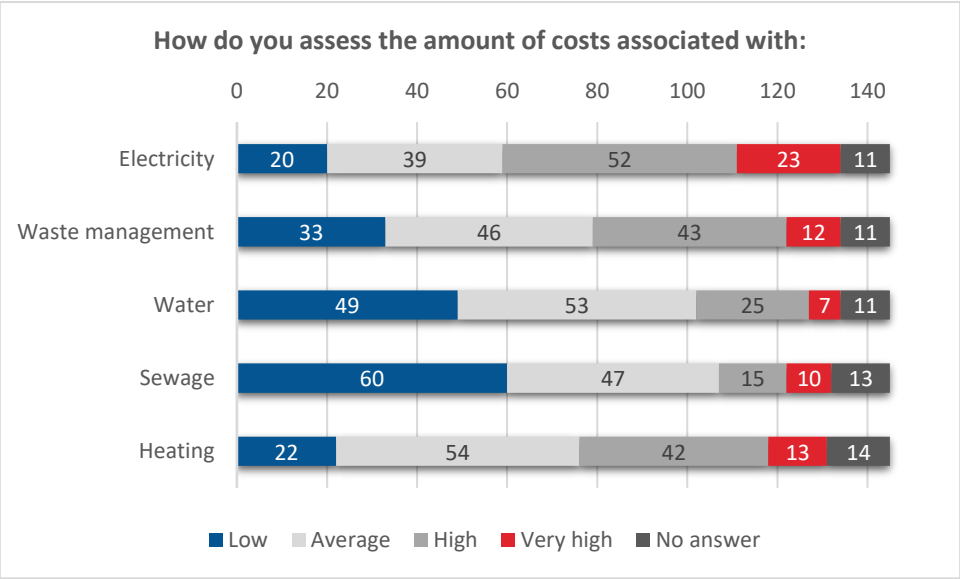
Figure 2: Main activity of the company – all countries



Source: Own study based on the findings of the survey, n=145; 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 (60 answers indicated low costs, 47 answers indicated medium) and water consumption (49 answers - low, 53 answers - medium). The highest number of responses indicating high (52 companies) or very high (23 companies) costs related to electricity.

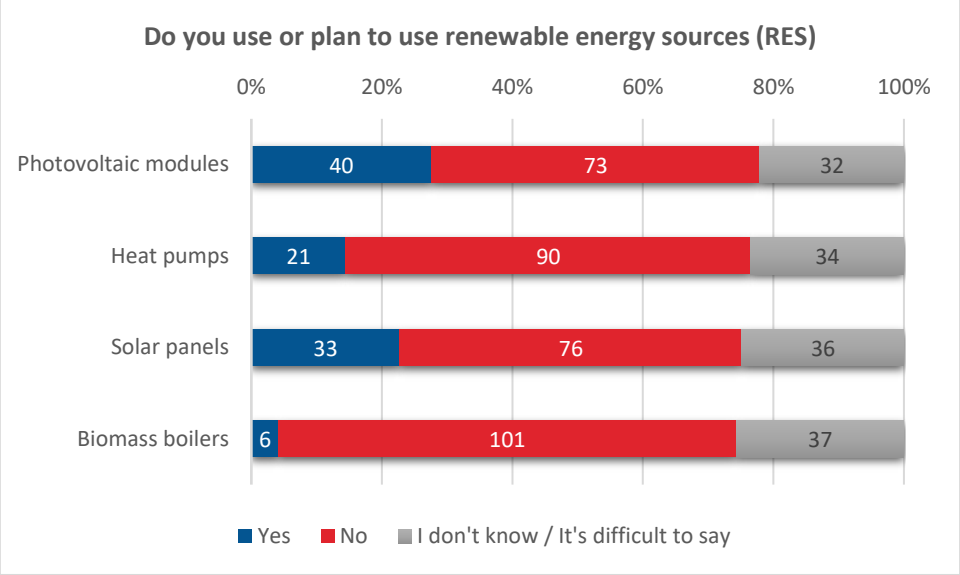
Figure 3: Costs incurred – all countries



Source: Own study based on the findings of the survey, n=145; 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 (101 answers). The 90 surveyed entrepreneurs are also not interested in heat pumps. On the other hand, the most interested are photovoltaic modules (40 companies) and solar collectors (33 companies) - Figure 141.

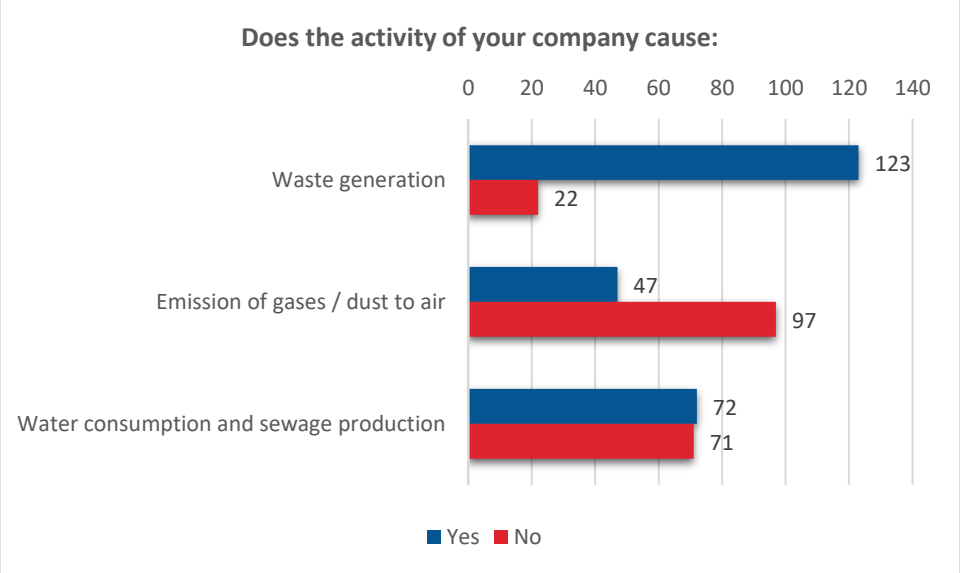
Figure 4: Use of renewable energy sources in companies – all countries



Source: Own study based on the findings of the survey, n=145; 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 (123 surveyed companies), emit gases and dust into the air (47 companies), and use water and produce sewage (72 companies) were identified - Figure 142.

Figure 5: Types of pollution generated by companies in their business activity – all countries



Source: Own study based on the findings of the survey, n=145; n - number of companies surveyed

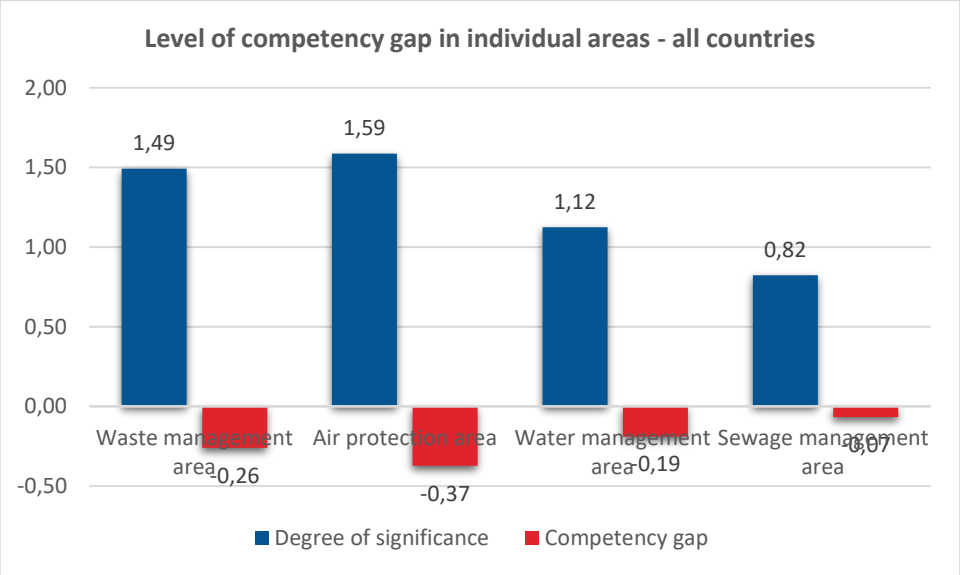
Within the identified areas, the surveyed entrepreneurs were asked to assess the degree of significance of particular competences related to environmental economy from the point of view of the specificity of their company's operations, on a scale from 0 to 3 (where 0 means that a given competence does 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 1.59 in case of air protection and 1.49 in case of waste management (Figure 143). The third most important area was water management (at 1.12). Slightly lower significance was attributed to sewage management (at 0.82). The greatest competence shortages of employees were recorded in the area of air protection - the gap was at -0.37.

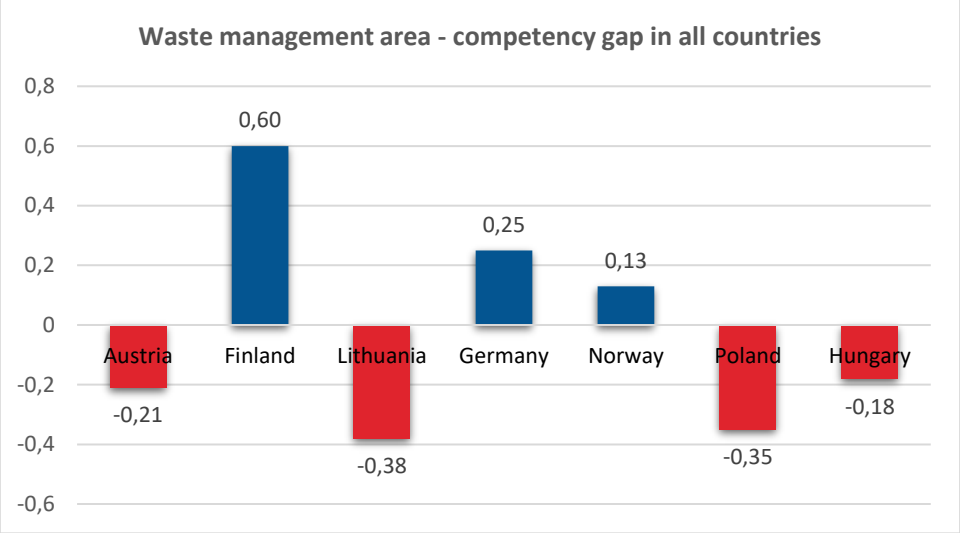
Figure 6: Level of competence gap in individual areas – all countries



Source: Own study based on the findings of the survey, n=145; 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.

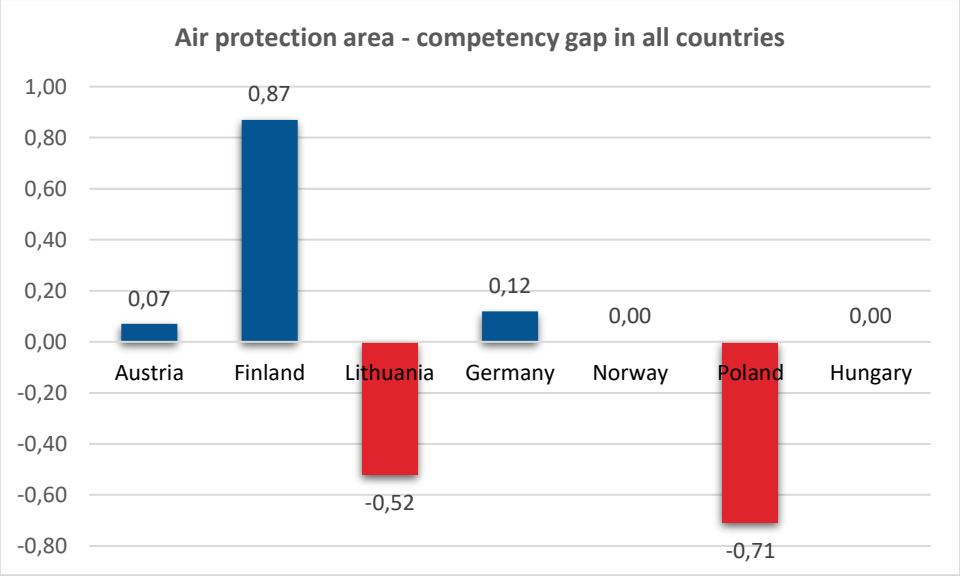
Figure 7: Level of competence gap in waste management area - comparison of all countries



Source: Own study based on the findings of the survey, n=145; n - number of companies surveyed

In the area of air protection, the largest competence gap is in Poland, where it was at the level of -0.71. Slightly smaller deficits were indicated by Lithuanian entrepreneurs, who assessed them at the level of -0.52. 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).

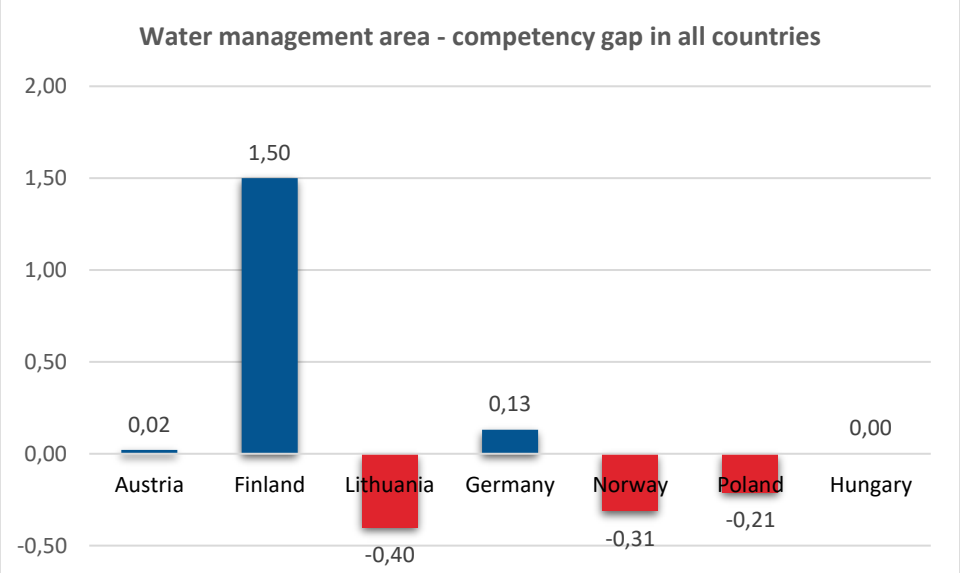
Figure 8: Level of competence gap in air protection area - comparison of all countries



Source: Own study based on the findings of the survey, n=145; 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).

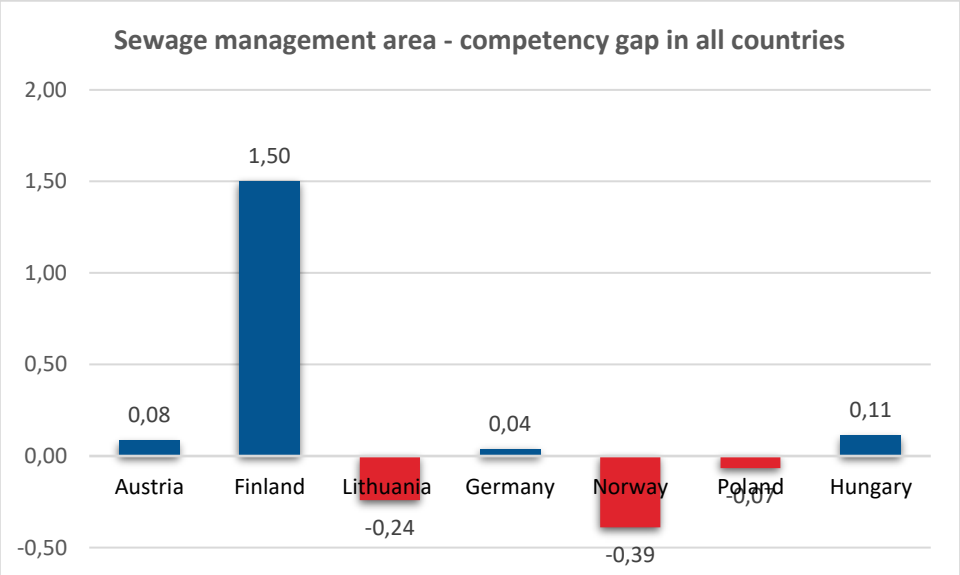
Figure 9: Level of competence gap in water management area - comparison of all countries



Source: Own study based on the findings of the survey, n=145; 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 10: Level of competence gap in sewage management area - comparison of all countries

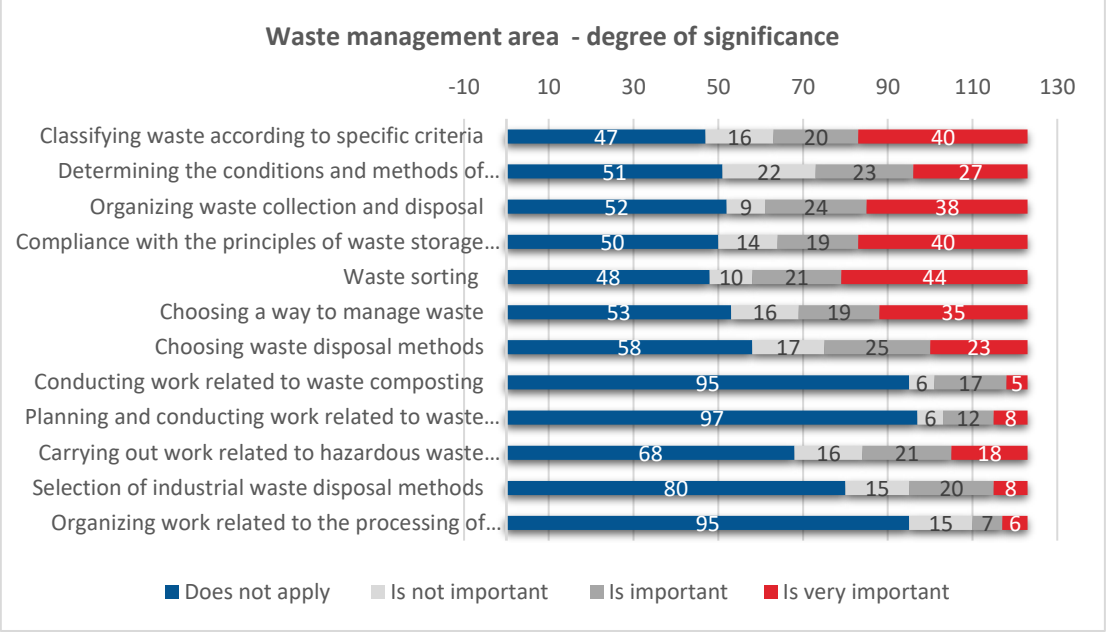


Source: Own study based on the findings of the survey, n=145; n - number of companies surveyed

3.21 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 11: Level of relevance of waste management competences – all countries

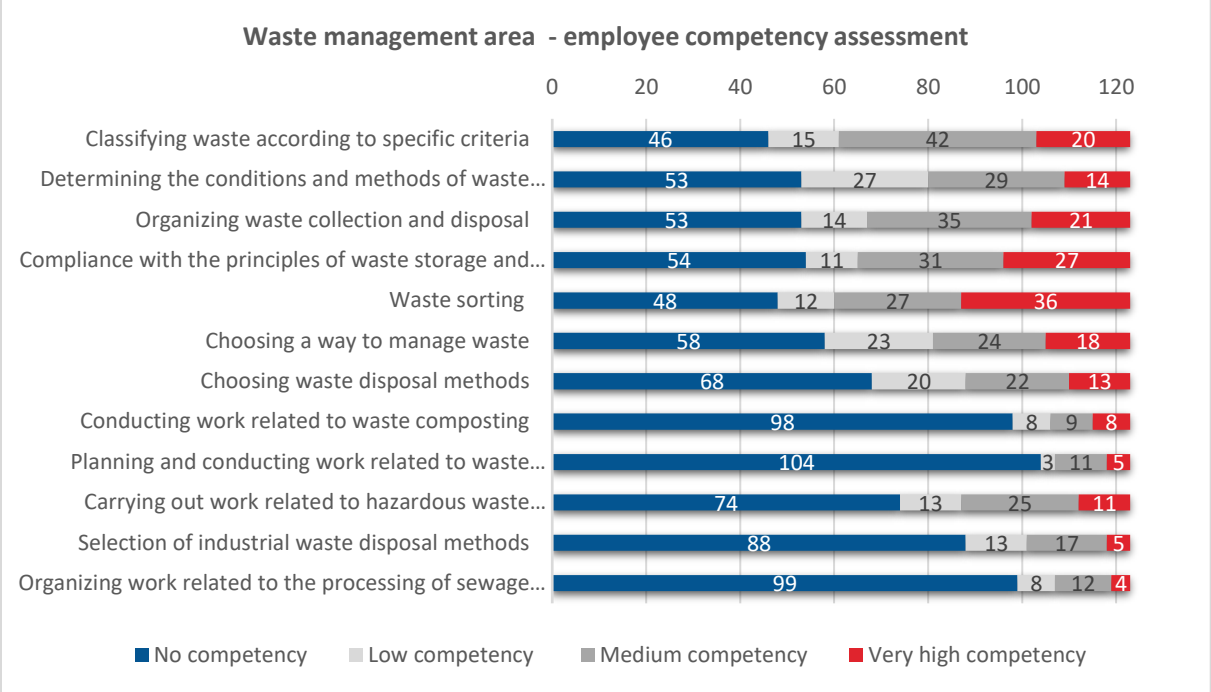


Source: Own study based on the findings of the survey, n=123; n - number of companies surveyed

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 - 104 indications, low competence - 3 indications), Organizing works related to sewage sludge treatment and equipment operation (lack of competence - 99 indications, low competence - 8 indications), Carrying out works related to waste composting (lack of competence - 98 indications, low competence - 8 indications), Selecting methods of industrial waste disposal (lack of competence - 88 indications, low competence - 13 indications).

Figure 12: Level of competence of employees in the field of waste management – all countries



Source: Own study based on the findings of the survey, n=123; 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 -0.42), Selection of waste disposal methods (competence gap at -0.34), Organization of waste collection and disposal (competence gap at -0.37) and Compliance with the principles of waste storage and storage (competence gap at -0.35).

Table 3: Specific competence gaps in waste management – all countries

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Waste management area	**1,49**	**1,23**	**-0,26**
1	Classifying waste according to specific criteria	2,25	1,93	-0,32
2	Determining the conditions and methods of waste disposal	1,87	1,57	-0,30
3	Organizing waste collection and disposal	2,08	1,71	-0,37
4	Compliance with the principles of waste storage and storage	2,07	1,72	-0,35
5	Waste sorting	2,29	2,01	-0,28

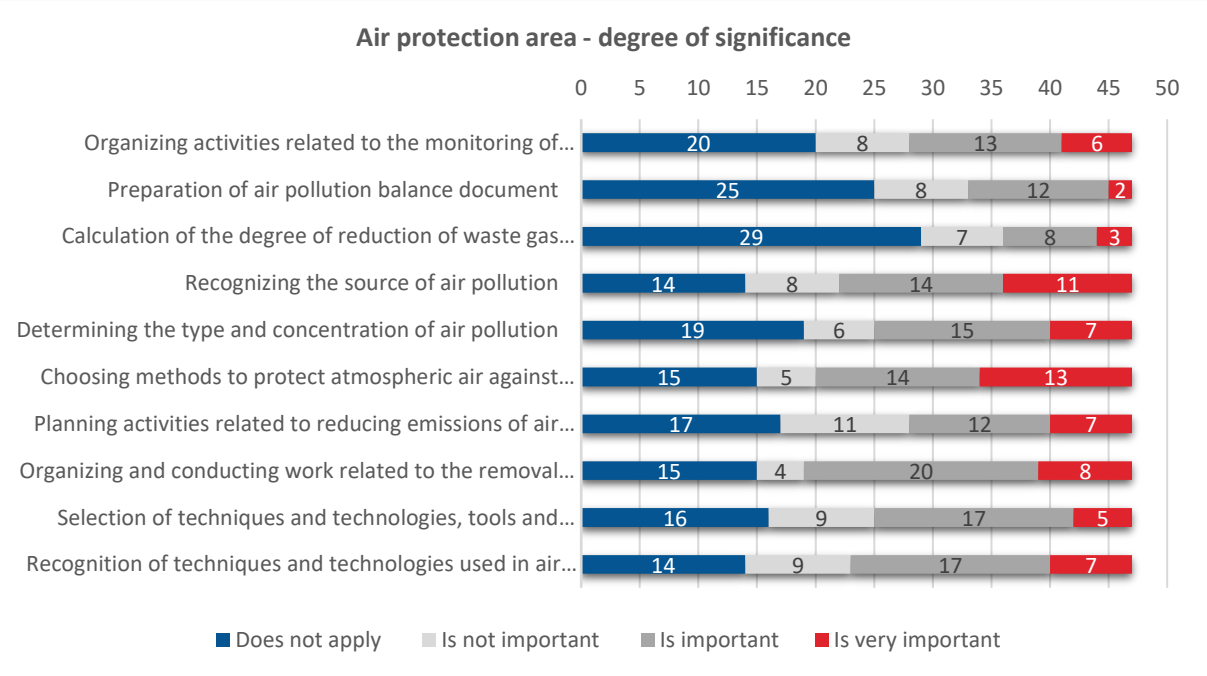
6	Choosing a way to manage waste	1,89	1,46	-0,42
7	Choosing waste disposal methods	1,52	1,18	-0,34
8	Conducting work related to waste composting	0,68	0,59	-0,09
9	Planning and conducting work related to waste incineration and operation of incineration plants	0,59	0,43	-0,16
10	Carrying out work related to hazardous waste management	1,16	0,97	-0,20
11	Selection of industrial waste disposal methods	0,93	0,69	-0,24
12	Organizing work related to the processing of sewage sludge and the operation of equipment	0,56	0,50	-0,06

Source: Own study based on the findings of the survey, n=123; n - number of companies surveyed

3.22 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).

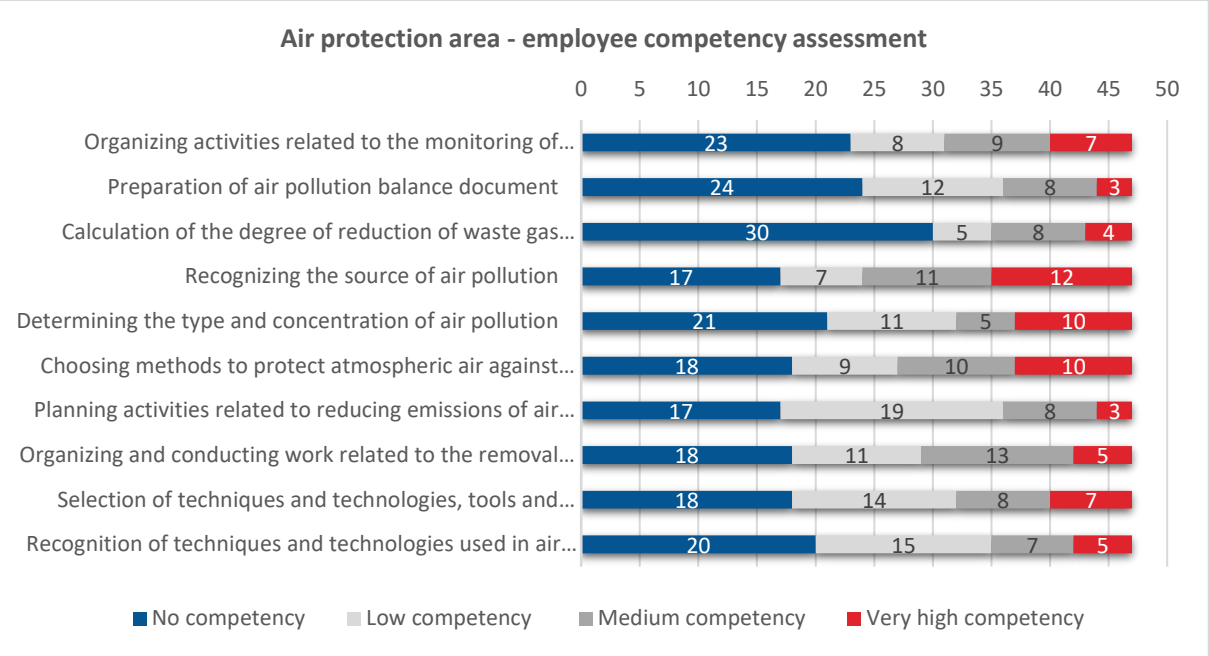
Figure 13: Level of relevance of competences in the field of air protection – all countries



Source: Own study based on the findings of the survey, n=47; 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 - 30 answers, low competence - 5 answers), Organizing air pollution monitoring activities (lack of competence - 23 answers, low competence - 8 answers), Preparing air pollution balances (lack of competence - 24 answers, low competence - 12 answers), Determining the type and concentration of air pollution (lack of competence - 21 answers, low competence – 11 answers) and Recognition of techniques and technologies used in air protection (lack of competence - 20 answers, low competence - 15 answers) - Figure 151.

Figure 14: Employees' level of competence in the field of air protection – all countries



Source: Own study based on the findings of the survey, n=47; 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 -0.66), Organization and performance of works related to the removal of pollutants from the air (competence gap at level -0.51), Selection of methods of air protection against pollution (competence gap at level -0.51), Planning action related to the reduction of emissions of pollutants into the atmosphere (competence gap at level -0.51).

Table 4: 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	**1,59**	**1,21**	**-0,37**
1	Organizing activities related to the monitoring of atmospheric air pollution	1,43	1,19	-0,23

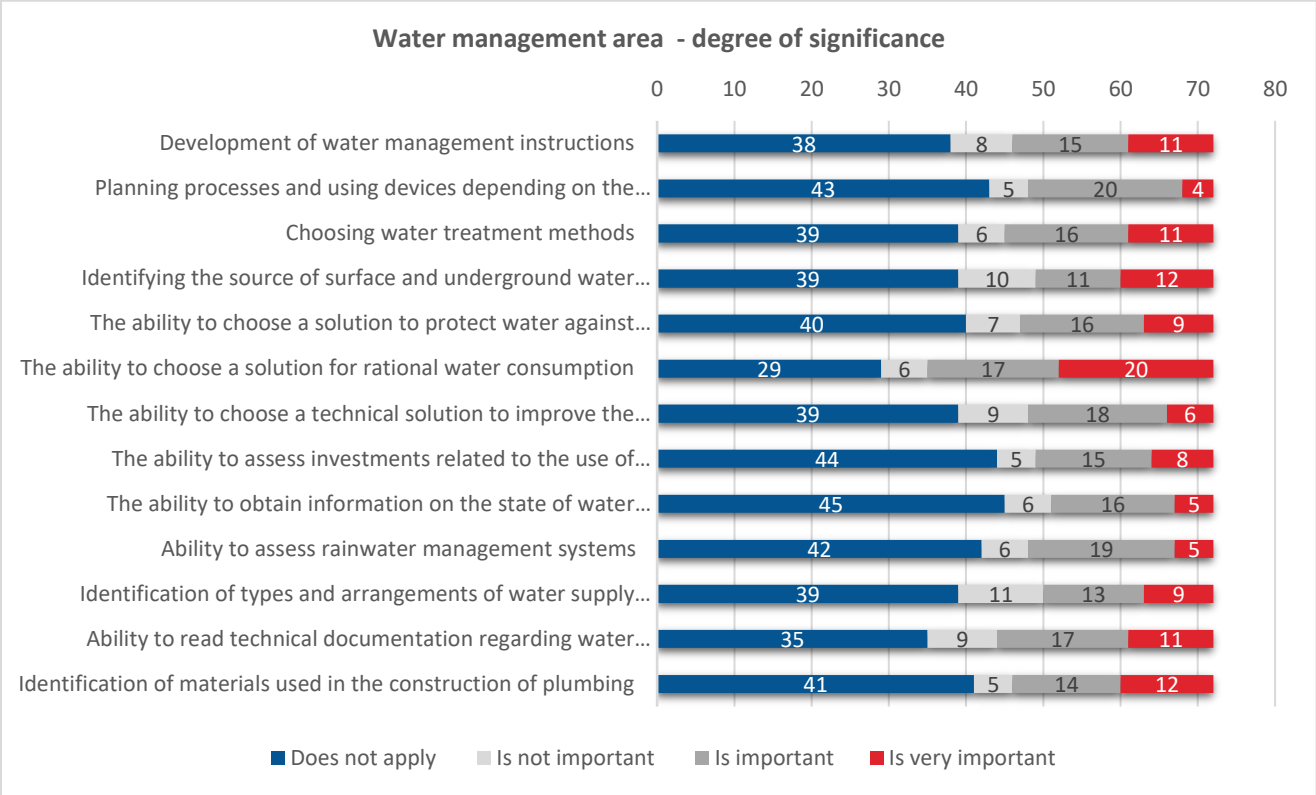
2	Preparation of air pollution balance document	1,11	0,96	-0,15
3	Calculation of the degree of reduction of waste gas impurities	1,00	0,89	-0,11
4	Recognizing the source of air pollution	1,91	1,62	-0,30
5	Determining the type and concentration of air pollution	1,66	1,30	-0,36
6	Choosing methods to protect atmospheric air against pollution	1,89	1,38	-0,51
7	Planning activities related to reducing emissions of air pollutants	1,74	1,21	-0,53
8	Organizing and conducting work related to the removal of atmospheric pollution	1,83	1,32	-0,51
9	Selection of techniques and technologies, tools and materials for air purification depending on the properties of removed impurities and process conditions	1,57	1,21	-0,36
10	Recognition of techniques and technologies used in air protection	1,72	1,06	-0,66

Source: Own study based on the findings of the survey, n=47; n - number of companies surveyed

3.23 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.

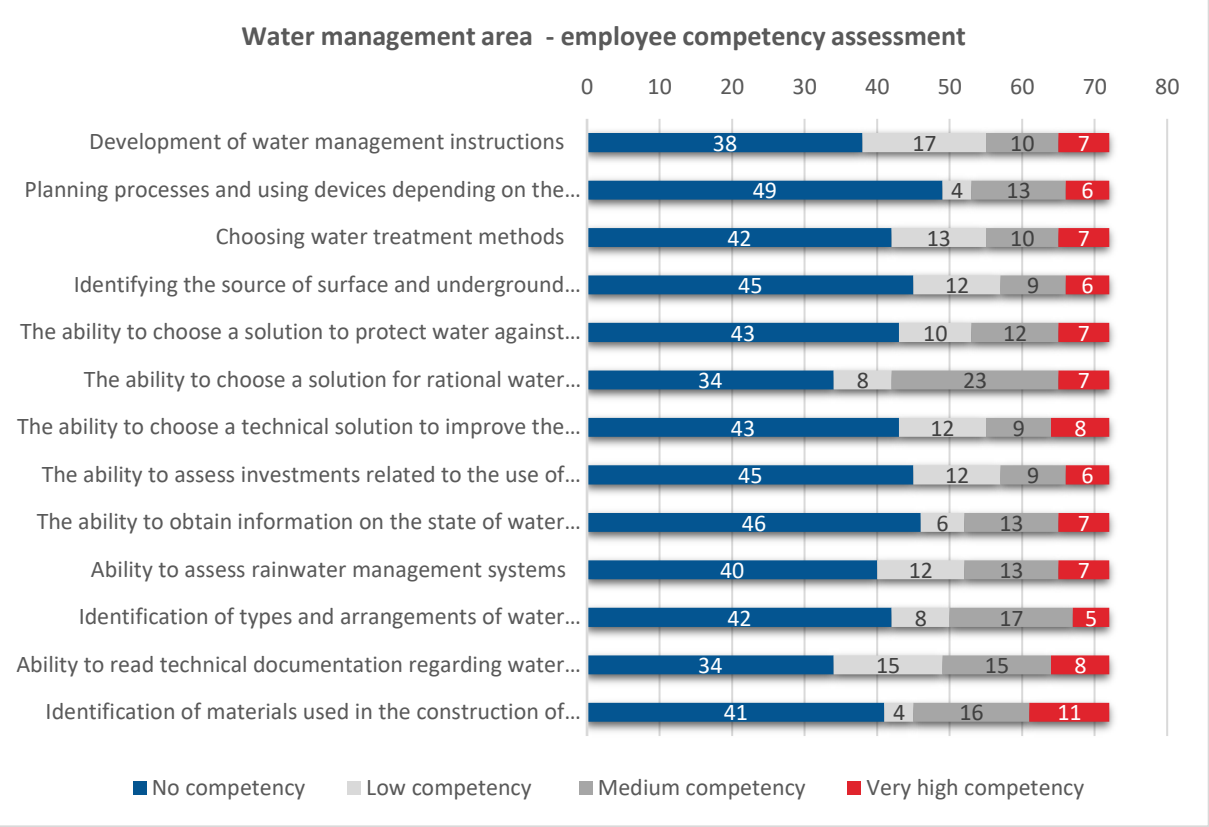
Figure 15: Level of relevance of competences in the field of water management – all countries



Source: Own study based on the findings of the survey, n=72; 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 - 45 answers, 12 - low competence), Ability to assess investments related to the use of groundwater resources (lack of competence - 45 answers, low competence - 12 answers), Preparation of water management instructions (lack of competence - 38 answers, low competence - 17 answers), Selection of water treatment methods (lack of competence - 42 answers, low competence - 13 answers), Ability to select a technical solution to improve the quality of water intake (lack of competence - 43 answers, low competence - 12 answers), Planning processes and using devices depending on the purpose and chemical composition (lack of competence - 49 answers, low competence - 4 answers) - Figure 153.

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



Source: Own study based on the findings of the survey, n=72; 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 -0.44), Development of water management instructions (competence gap at the level of -0.33), Identification of the source of surface water and groundwater pollution (competence gap at the level of -0.31), Selection of water treatment methods (competence gap at the level of -0.31). The level of competence gaps in particular competences is presented in Table 32.

Table 5: Specific competence gaps in water management – all countries

	Competency	Degree of significance for the company	Employee competency assessment	Competency gap
	Water management area	**1,12**	**0,93**	**-0,19**
1	Development of water management instructions	1,36	1,03	-0,33
2	Planning processes and using devices depending on the purpose and chemical composition	1,04	0,82	-0,22
3	Choosing water treatment methods	1,13	0,82	-0,31
4	Identifying the source of surface and underground water pollution	1,08	0,78	-0,31

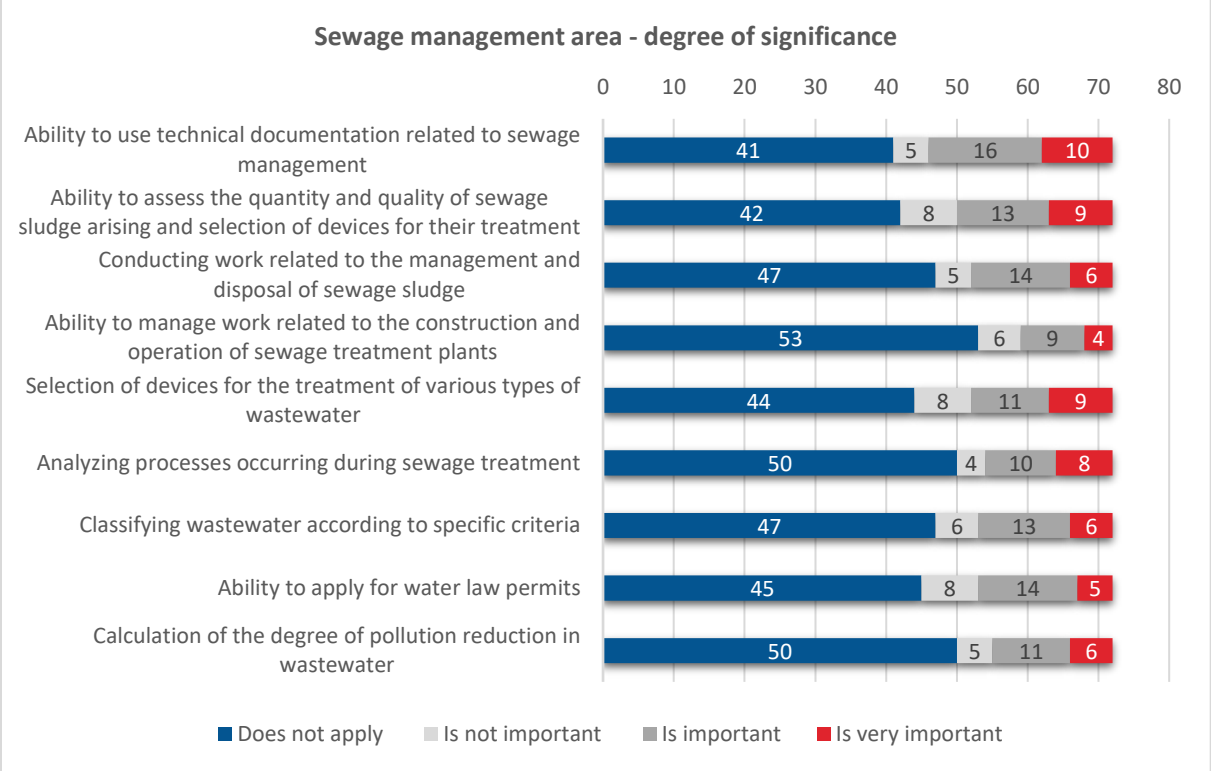
5	The ability to choose a solution to protect water against secondary pollution	1,04	0,86	-0,18
6	The ability to choose a solution for rational water consumption	1,83	1,39	-0,44
7	The ability to choose a technical solution to improve the quality of captured water	1,04	0,85	-0,19
8	The ability to assess investments related to the use of groundwater resources	0,90	0,72	-0,18
9	The ability to obtain information on the state of water resources, available types of surface and underground water, and types of water intakes	0,90	0,83	-0,07
10	Ability to assess rainwater management systems	0,99	0,94	-0,04
11	Identification of types and arrangements of water supply networks on the company's premises	0,99	0,90	-0,08
12	Ability to read technical documentation regarding water management	1,21	1,10	-0,11
13	Identification of materials used in the construction of plumbing	1,10	1,11	0,01

Source: Own study based on the findings of the survey, n=72; n - number of companies surveyed

3.24 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 17: Level of relevance of competences in the field of wastewater management – all countries



Source: Own study based on the findings of the survey, n=72; 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 (54 answers), Classification of sewage according to specific criteria (53 answers), Calculation of the degree of pollution reduction in sewage (51 answers), Analysis of processes occurring during sewage treatment (51 answers).

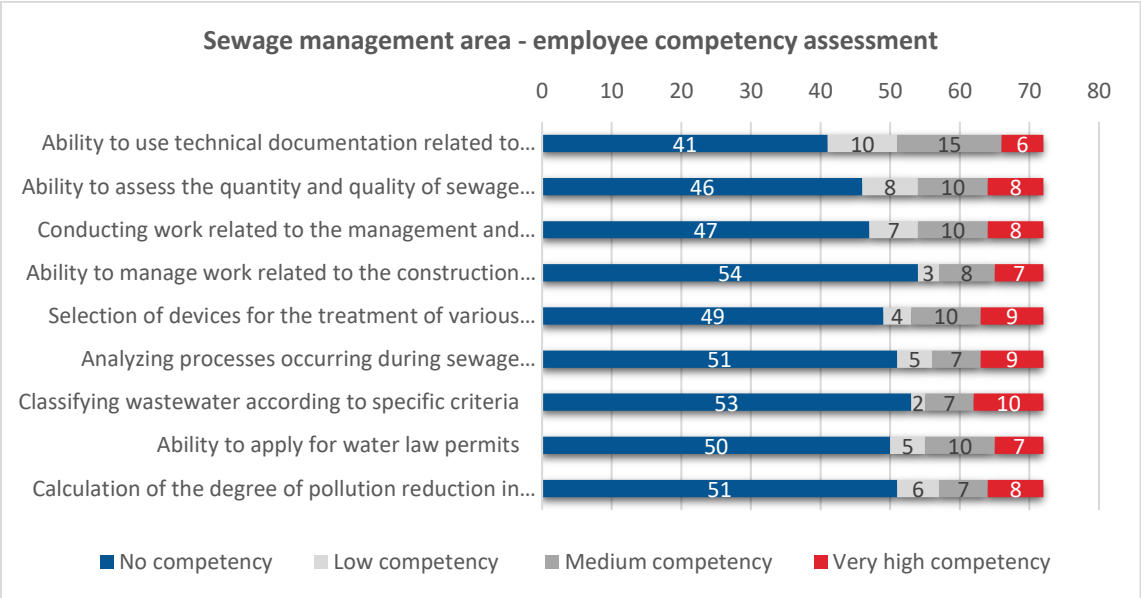


Figure 18: Employees' level of competence in the field of wastewater management – all countries

Source: Own study based on the findings of the survey, n=72; 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 6: 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 wastewaters	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=72; n - number of companies surveyed

3.4 Education recommendations - competence profiles

3.41 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 7: 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 8: 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 9: 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 10: 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 wastewater management, along with their relation to the 3 levels of education, recommendations can be made for 'greening' of education programmes.

3.42 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 11: Competences recommended for secondary education

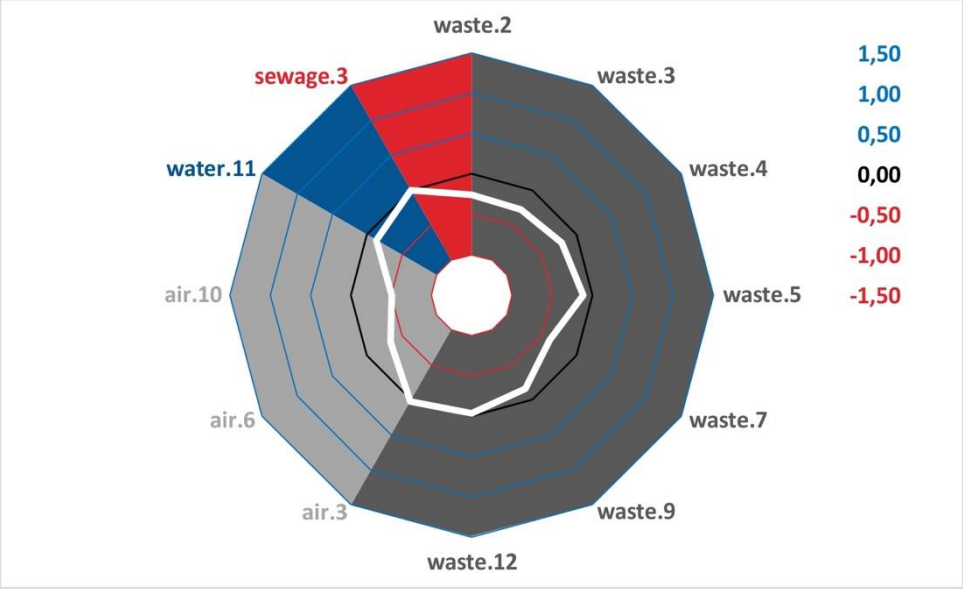
	Competency	Competence profile
	Waste management area	
2	Determining the conditions and methods of waste disposal	waste.2
3	Organizing waste collection and disposal	waste.3
4	Compliance with the principles of waste storage and storage	waste.4
5	Waste sorting	waste.5
7	Choosing waste disposal methods	waste.7
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 wastewater 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 19: 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

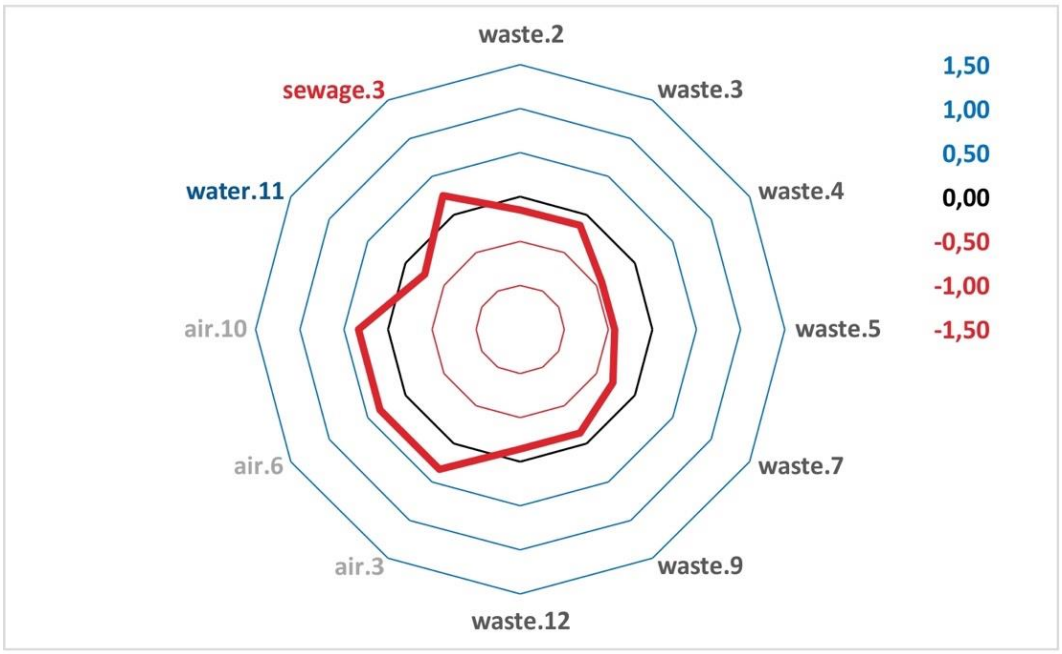
The figure shows that in secondary education programs such effects of green competence education as: Determining the conditions and methods of waste disposal (waste.2); Organizing waste collection and disposal (waste.3); Compliance with the principles of waste storage and storage (waste.4); Choosing 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 programs, 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 20: Competency profile at secondary education level – Austria



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

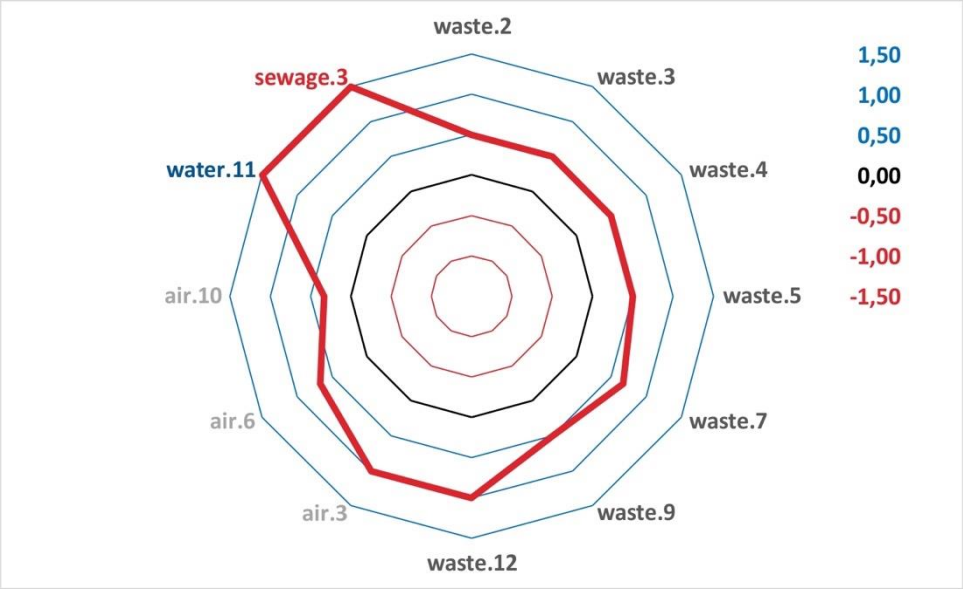
In Austria, the level of competence gaps in relation to secondary education shows that the educational programs should place particular emphasis on learning outcomes such as: Compliance with the principles of waste storage and storage (waste.4); Waste sorting (waste.5); Choosing waste disposal methods (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 programs. 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 21: 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 employees exceeded the needs of enterprises. This may signify that there are good educational practices

in this country. Nevertheless, all of the analyzed 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 22: 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).

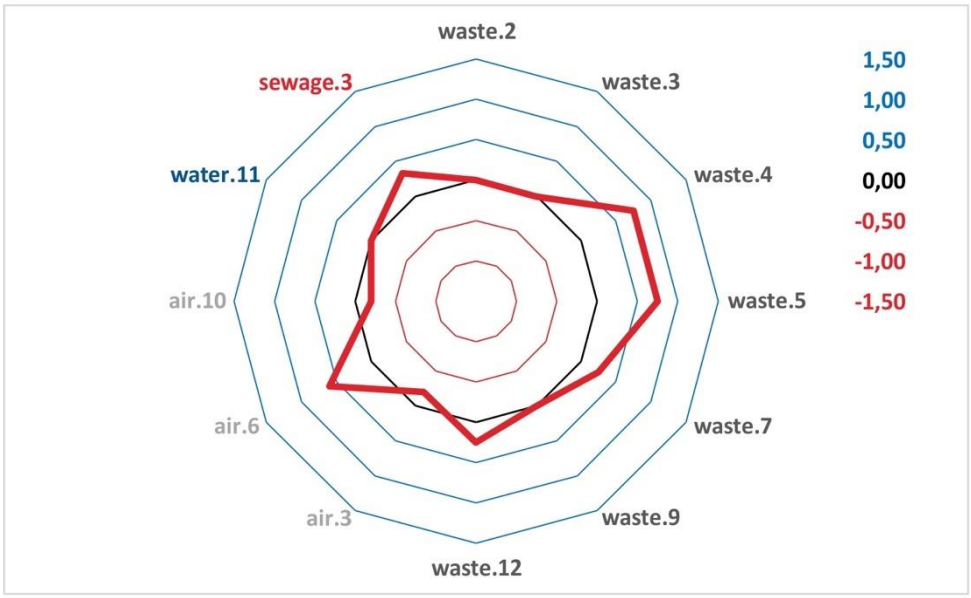


Figure 23: Competency profile at secondary education level – Germany

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

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.

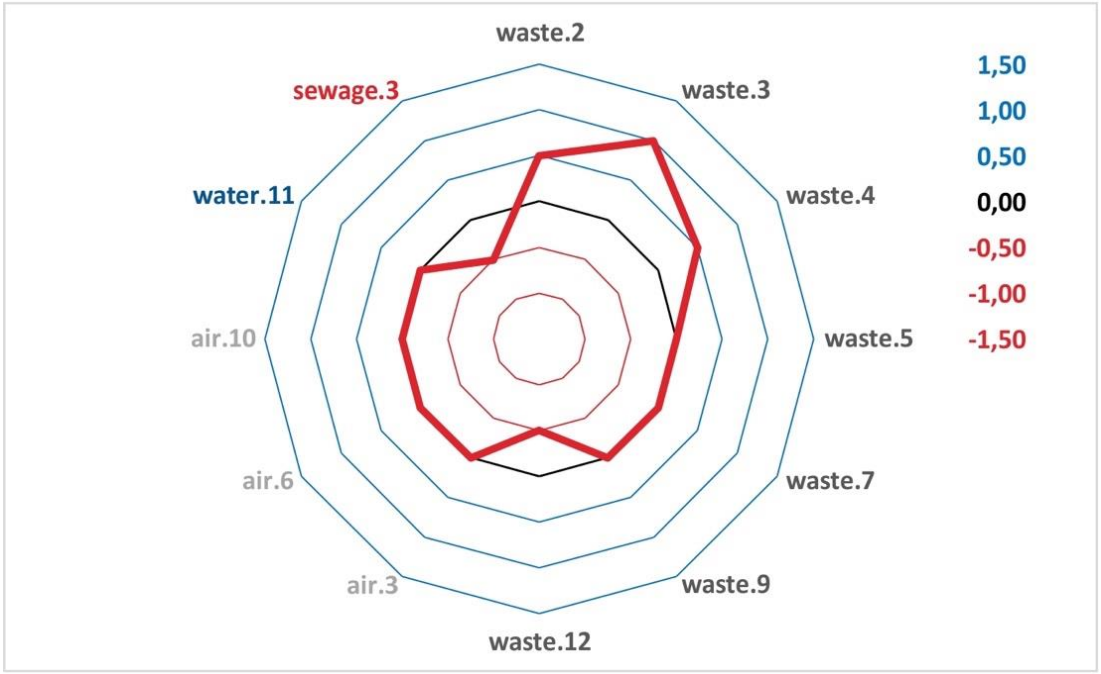
The data on the green competence profile for secondary education in Germany are presented in Figure 160.

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 24: 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 programs 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 25: Competency profile at secondary education level – Poland

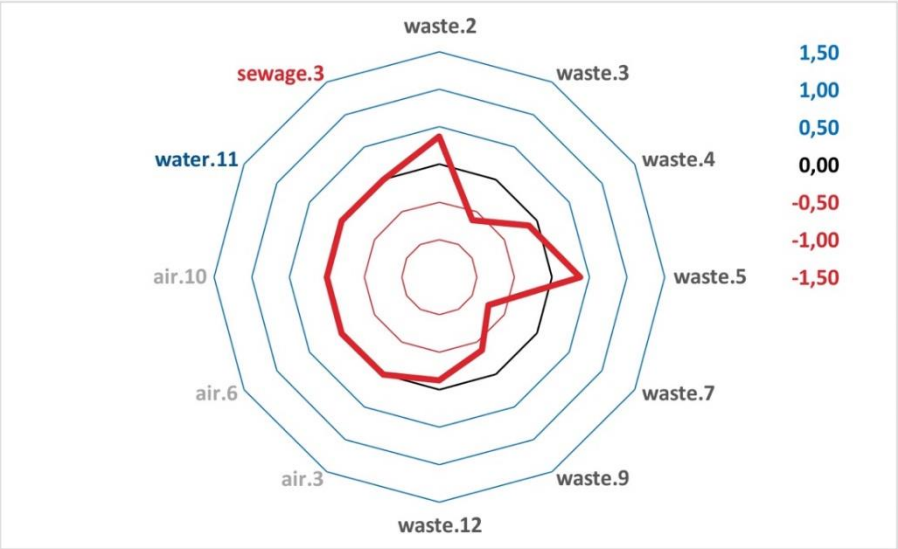
Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

In Poland, the level of competence gaps in relation to secondary education shows that in educational programs 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 26: 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.

3.43 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 12: Competences recommended for higher education

	Competency	Competence profile
	Waste management area	
6	Choosing a way to manage waste	waste.6

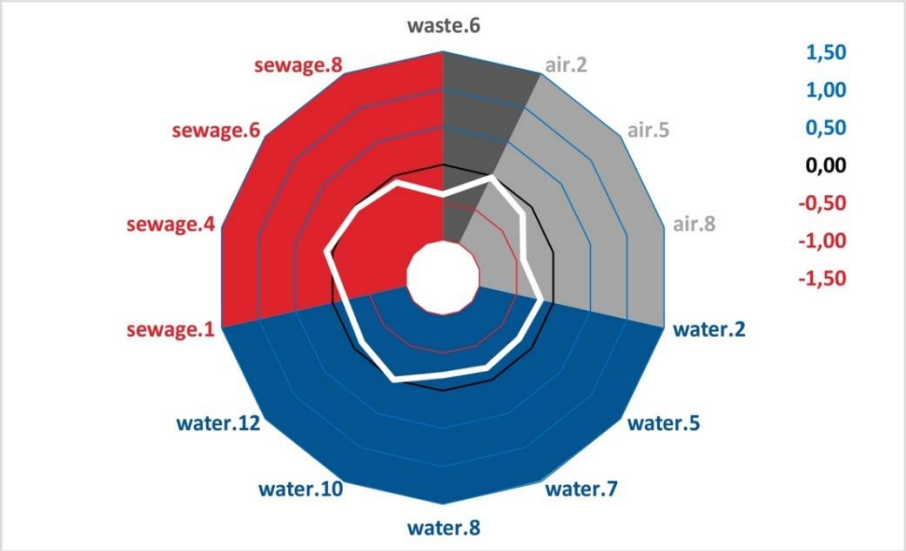
	Air protection area			
2	Preparation of air pollution balance document			air.2
5	Determining the type and concentration of air pollution			air.5
8	Organizing and conducting work related to the removal of atmospheric pollution			air.8
	Water management area			
2	Planning processes and using devices depending 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 wastewater 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 27: 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

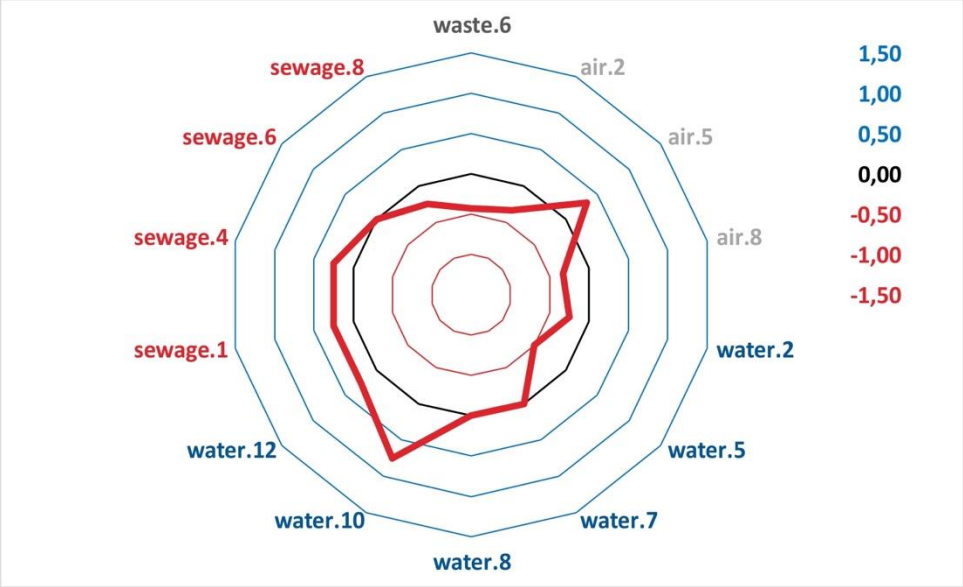
The figure indicates that in higher education programmes, emphasis should be placed on such green competence learning outcomes as: Choosing a way to manage waste (waste.6); Organizing and conducting work related to the removal of atmospheric pollution (air.8).

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 28: Competency profile at higher education level – Austria



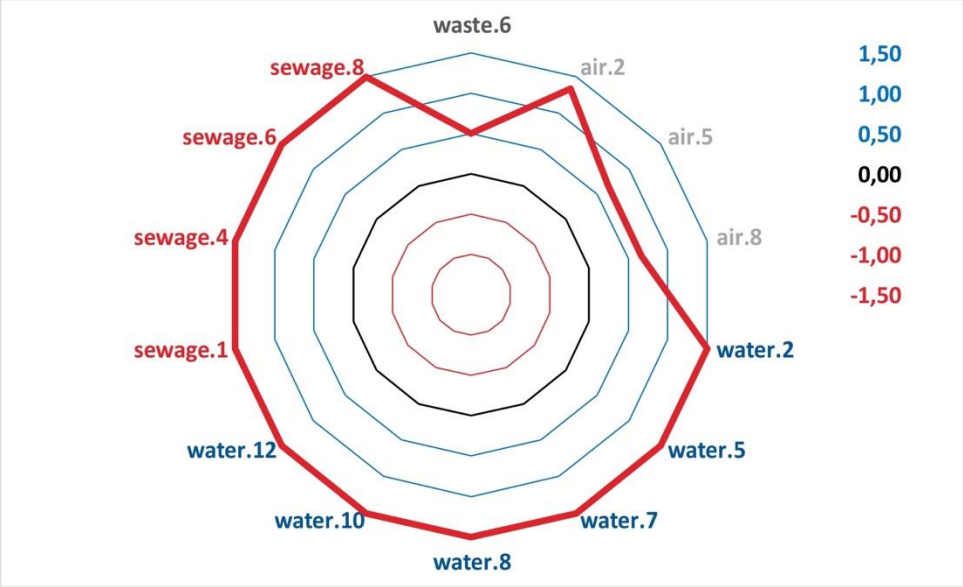
Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

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.

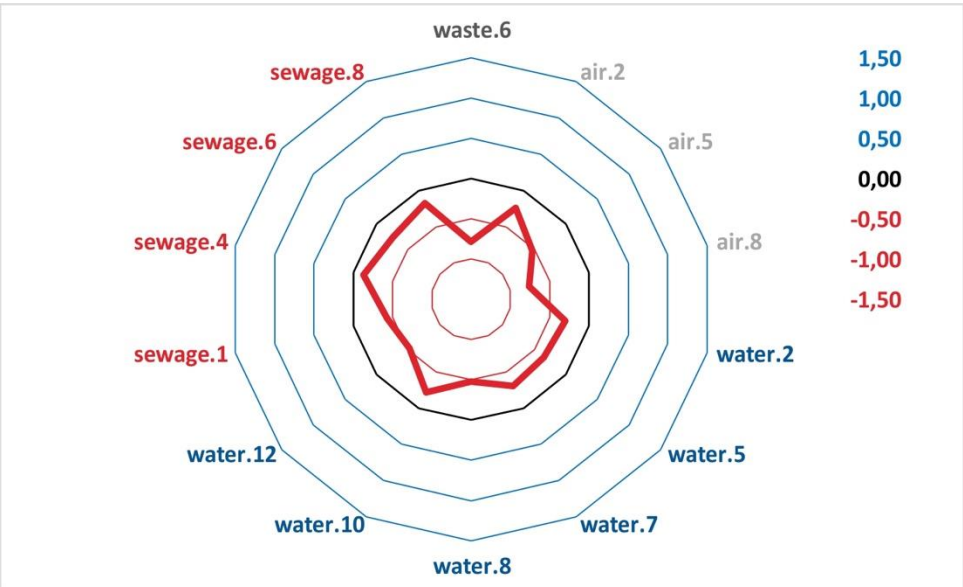
Figure 29: Competency profile at higher education level – Finland



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 30: 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 programs 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

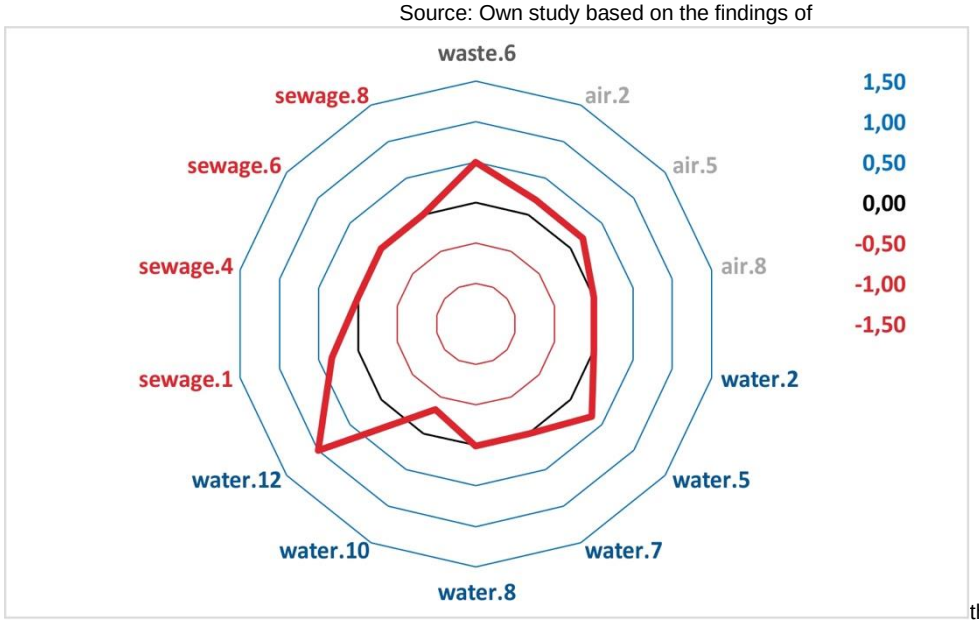
atmospheric pollution (air.8); Organizing and conducting work related to the removal of atmospheric pollution (air.5); The ability to assess investments related to the use of groundwater resources (water.8); Ability to read technical documentation regarding water management (water.12); Ability to use 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 31: Competency profile at higher education level – Germany

Source: Own study based on the findings of

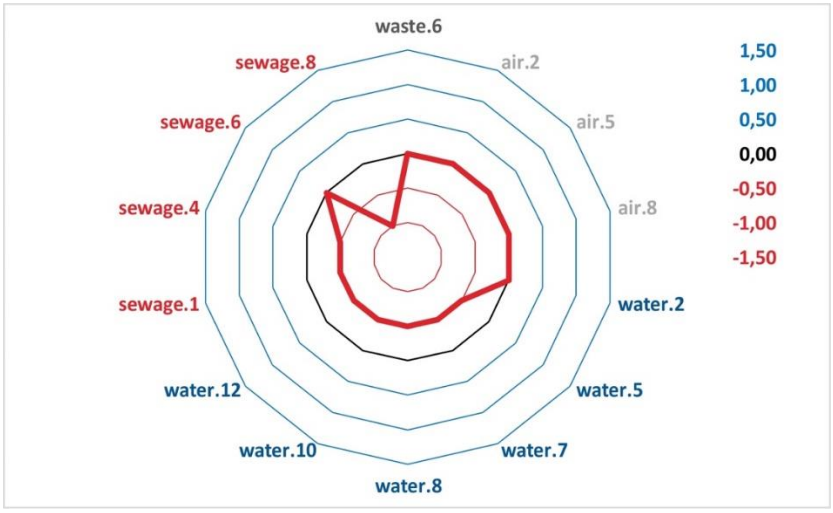


the survey, n=7; n - number of companies surveyed

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 programs. The aforementioned excesses of competences should be assessed positively, bearing in mind that these areas should also be included in education programs, but do not have to be prioritized.

The data on the profile of green competences for secondary education in Norway are presented in Figure 169.

Figure 32: Competency profile at higher education level – Norway



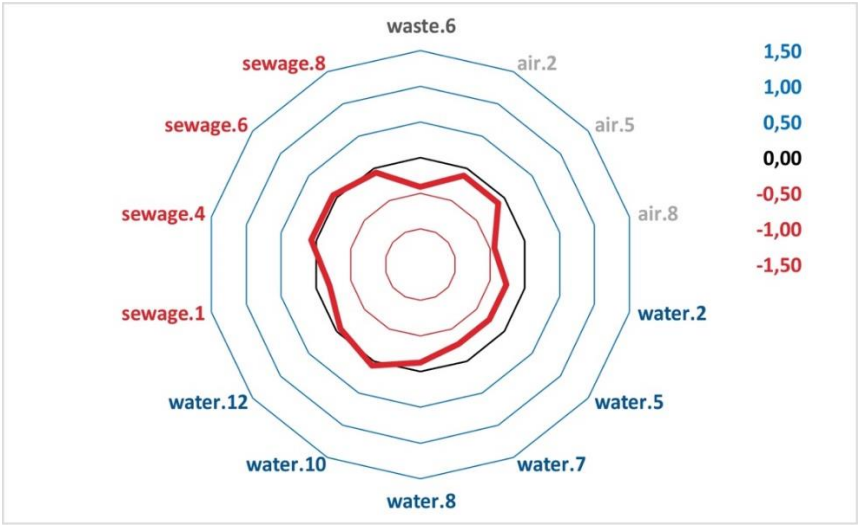
Source: Own study based on the findings of the survey, n=2; n - number of companies surveyed

In Norway, the level of competence gaps in relation to higher education shows that the educational programs 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 33: Competency profile at higher education level – Poland

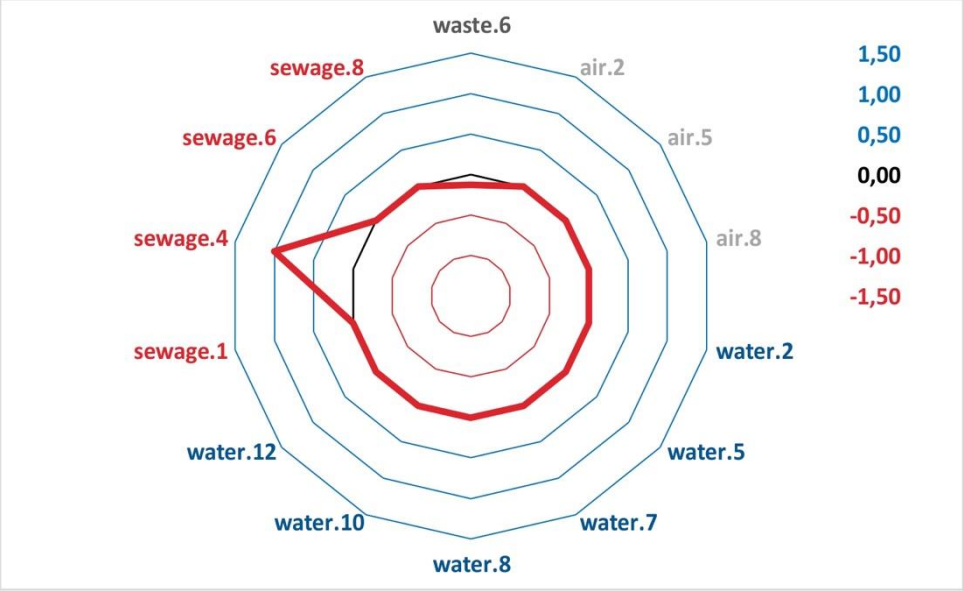


Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

In Poland, the level of competence gaps relating to higher education shows that the educational programs 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 programs 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 34: 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 programs, but this does not mean that other areas should not be included in education programs, but they do not have to be given priority.

3.44 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.

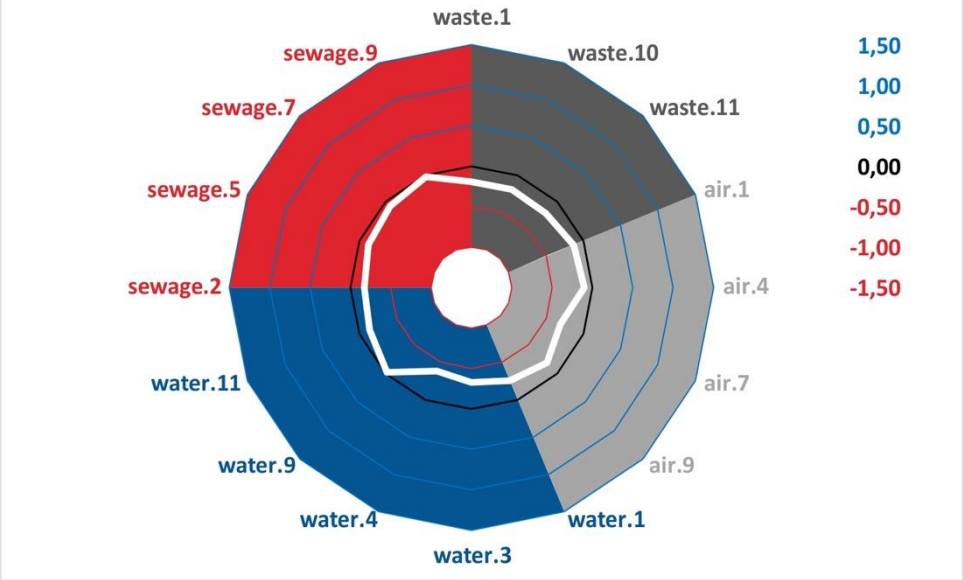
Table 13: Competences recommended for lifelong learning

	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 wastewater 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 35: 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 programs 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

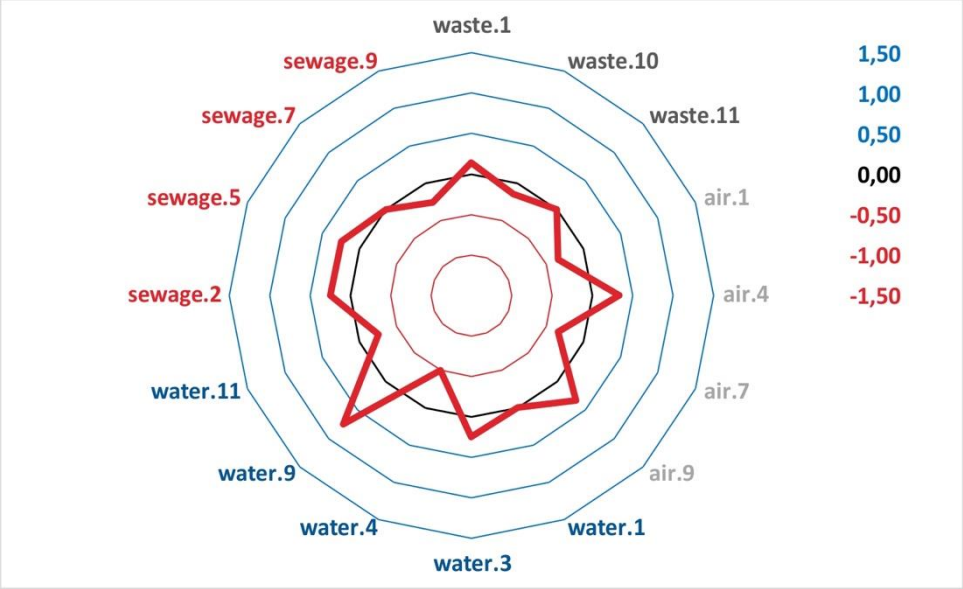
related to reducing emissions of air pollutants (air.7); Development of water management instructions (water.1).

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 36: 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).

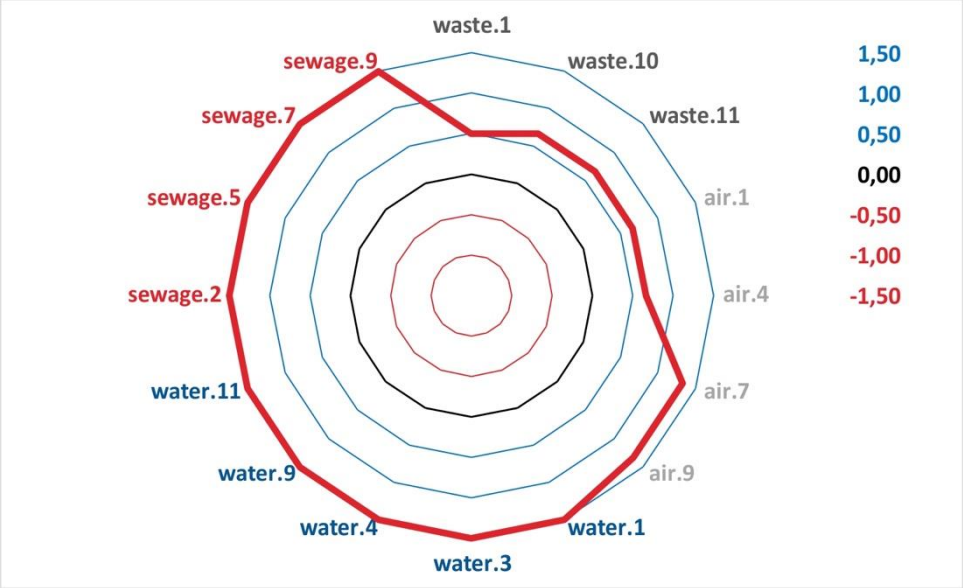
For the other learning outcomes, gaps are minimal or even existing employee competences exceed the current requirements in the assessment of enterprises (gap level is positive). Competence surpluses concern mainly: The ability to obtain information on the state of water resources, available types of 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 programs, 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 37: Competency profile at lifelong learning level – Finland

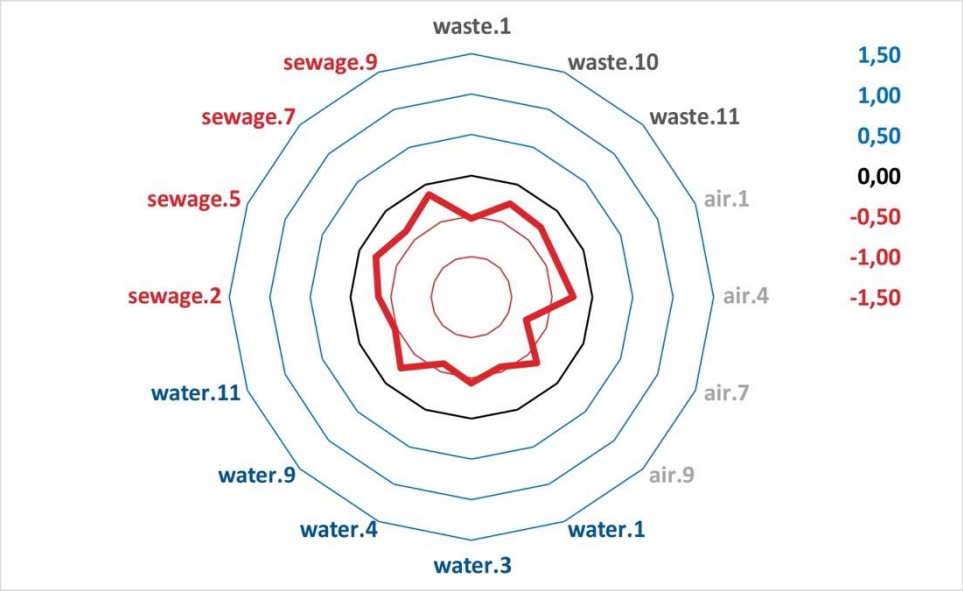


Source: Own study based on the findings of the survey, n=6; n - number of companies surveyed

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 38: Competency profile at lifelong learning level – Lithuania

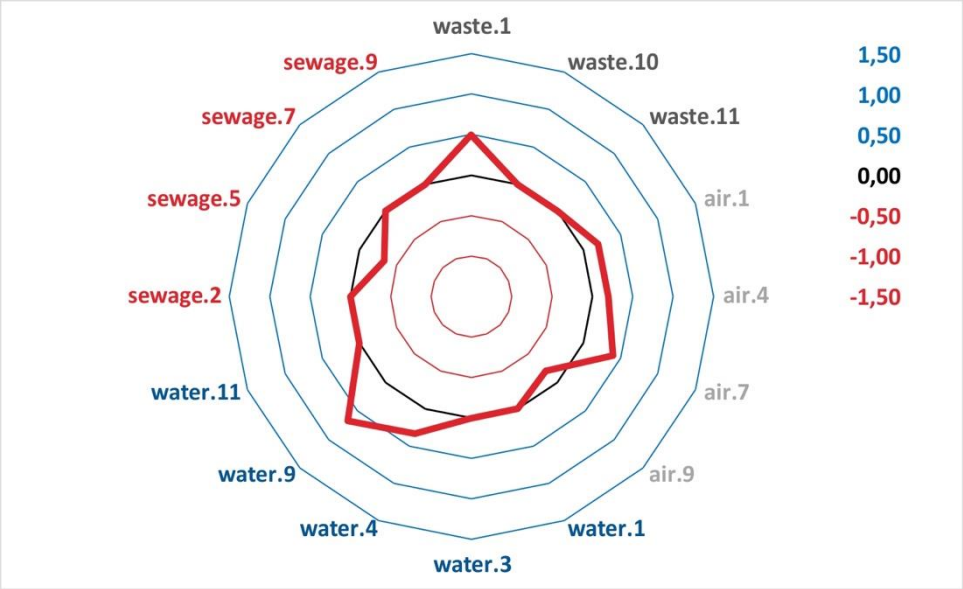


Source: Own study based on the findings of the survey, n=38; n - number of companies surveyed

In Lithuania, from the level of competence gaps relating to lifelong learning, it is clear that the educational programs 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 39: Competency profile at lifelong learning level – Germany



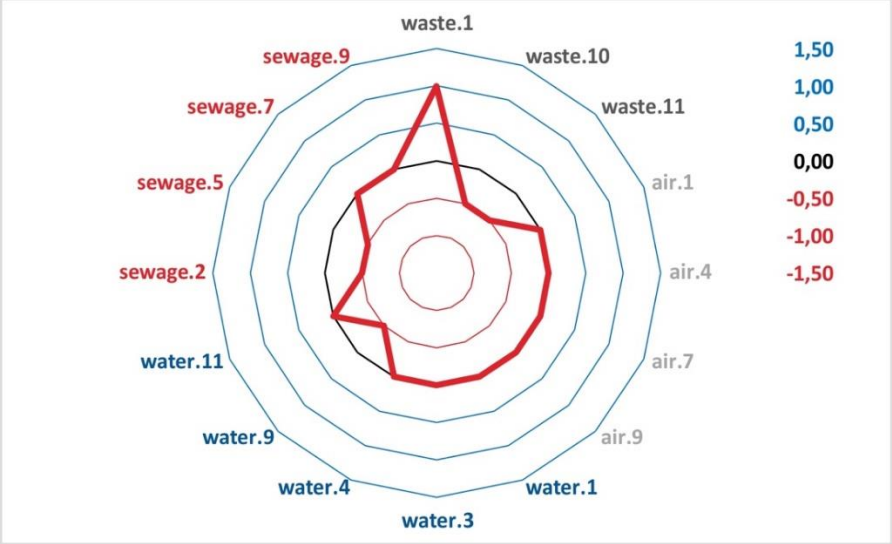
Source: Own study based on the findings of the survey, n=7; n - number of companies surveyed

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 40: Competency profile at lifelong learning level – Norway



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

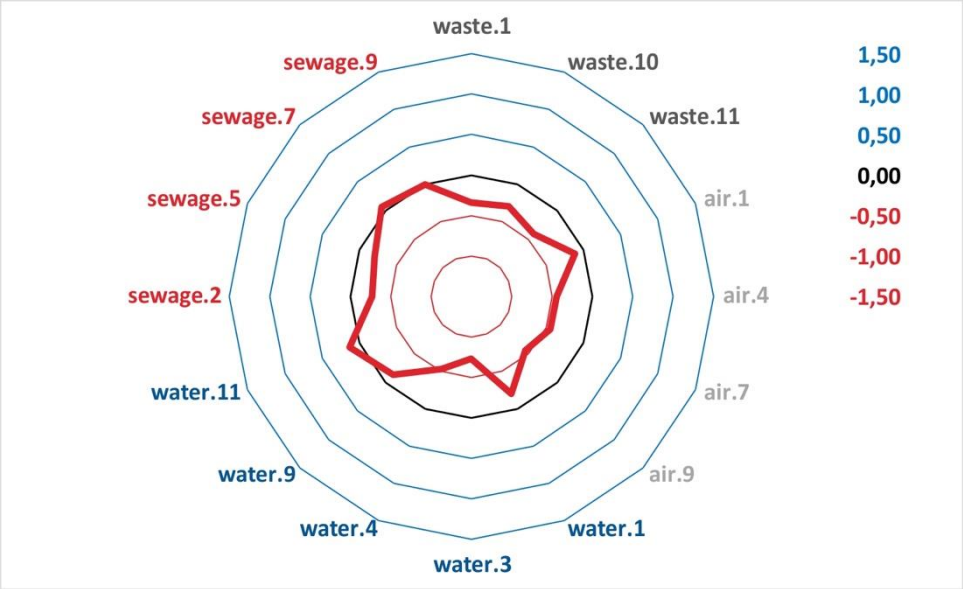
From the level of competence gaps in Norway relating to lifelong learning, it appears that the educational programs should place particular emphasis on learning outcomes such as: Carrying out work related to hazardous waste management (waste.10); Selection of industrial waste disposal methods (waste.11); 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 41: Competency profile at lifelong learning level – Poland



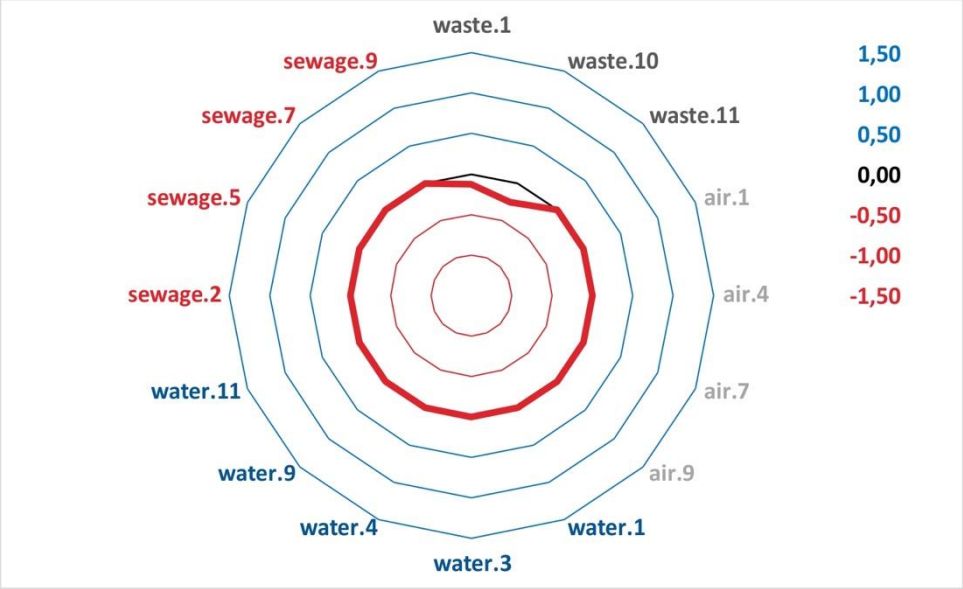
Source: Own study based on the findings of the survey, n=28; n - number of companies surveyed

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 42: 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.

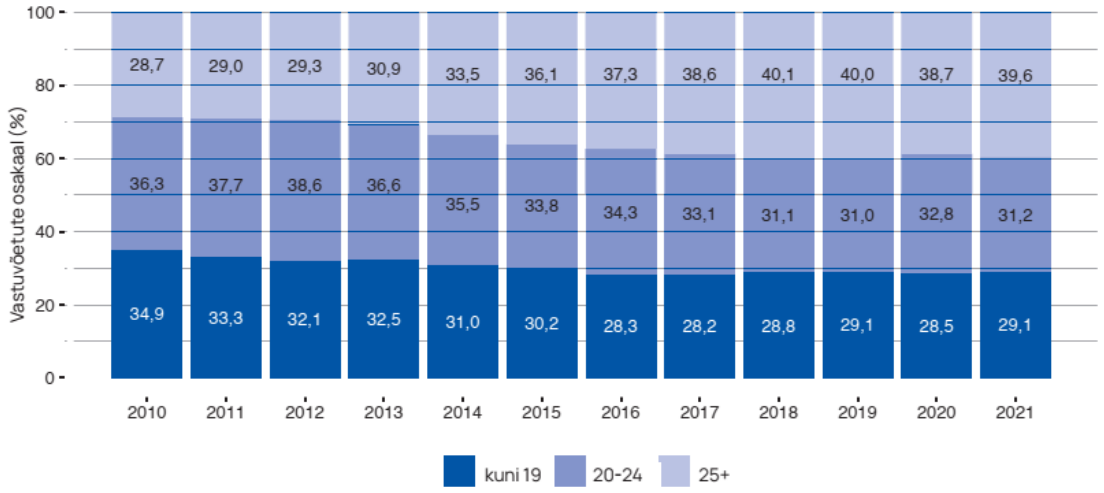
At the same time, this does not mean that the remaining learning outcomes of green competences specific to the level of lifelong learning should be left out of the curriculum, but the level of the gap indicates current priorities.

4. Analysis of the demand and qualification requirements of "Energy Service Manager" in Estonia[51]

Within the framework of the BA&VET project, the two continuing education courses "Sustainable Management" and "Energy Service Manager" were developed and implemented, which can be completed alternatively within the framework of a dual Bachelor's degree program or as independent continuing education courses with a recognized professional continuing education qualification. Within the framework of the project, the courses are implemented as independent further education courses in the partner countries Poland and Estonia.

In Estonia, qualification as a certified energy consultant (Energy Service Manager) has so far only taken place as part of university degree courses. Brief specific analyses were carried out in Estonia in order to determine the demand and qualification requirements for this qualification as part of further vocational training.

As can be seen from the table below, in Estonia the average age of university students keeps growing.



Joonis 3. Kõrgharidusõppesse vastuvõetute vanuseline jaotus Eestis
Allikas: Eesti Hariduse Infosüsteem portaali Haridussilm vahendusel

On the one hand it is due to the diminishing population of the younger generation, and on the other hand, thanks to the realization of life-long learning practices. In Estonia, higher education is also free of charge for citizens, meaning the state provides the funding for the higher education in the form of general support for institutions. Nevertheless, these favorable conditions we cannot affirm that the number of younger people graduated from the high schools enroll at a university. Two main obstacles are:

(1) Vocational training and education have been promoted and communicated much more to students in high schools and secondary schools which leads some of them to opt for a vocational degree.
(2) Living costs have been constantly rising which means that though the attendance in university is free of charge, high living costs inhibit the possibility to opt for it.

According to the Foresight Center (in Estonian: Eesti Arenguseire Keskus), which came to force in order to help Estonian Parliament to make better and more informed long-term

[51] Compiled by Estonian Chamber of Commerce and Industry

decisions already more than 2/3rd of university students is working while studying. How to proceed with free of charge university degrees under these circumstances will be an important discussion topic for the upcoming years.

Similarly, to other EU and OECD countries, Estonia has a challenge to keep higher education institutions up to date with ever changing developments and innovations in all areas and sectors.

The global trend of distant learning and micro degrees in universities has also reached Estonia. Fortunately, several micro degrees have been launched which tackle the green economy and ESG topics. Some of them have been designed jointly by different universities, which highlights the fact that green economy related educational needs are cross-sectorial and need collaboration of different parties.

There are several successful examples:

- Estonian Business School has trained the managers/future managers already 3 years in ESG related topics;
- Taltech and Tallinn University ran a pilot micro degree programme on sustainable management in autumn 2022 and plan to continue in upcoming seasons
- In 2023 Taltech also launched “Contemporary topics in accounting and finance through the prism of ESG and financial innovation” programme.

Nowadays, we have noticed some slow movement towards covering green economy-related topics. In order to succeed lots of re-training and reskilling has to be done by trainers and private sector training institutions.

When it comes to vocational education, the number of students in it has increased constantly. Between 2011 and 2016, the employment of people with vocational education increased the most, rising from 68% to 73%. 2015 graduates earned 55% more in 2016 than 2010 graduates in 2011[52]. However, **the proportion of people who have completed vocational secondary education continuing in higher education is still very small**: on average only 6% of alumna in a year[53]. Throughout the creation of integral strategy for Estonian education from 2025-2035 it was universally agreed by experts that there is a high need to (1) speedier update the educational programs in vocational training institutions; (2) more flexibility to re-skilling and re-training modules since the proportion of life-long learners in vocational institutions is growing and (3) more collaboration with companies to have work-based-learning happening in wider scale[54].

From Estonian general employment prediction which is carried out by OSKA and Ministry of Economic Affairs and Communications experts, the statistics show that there is a high number of people leaving the employment in coming years[55]. The graph below shows that from

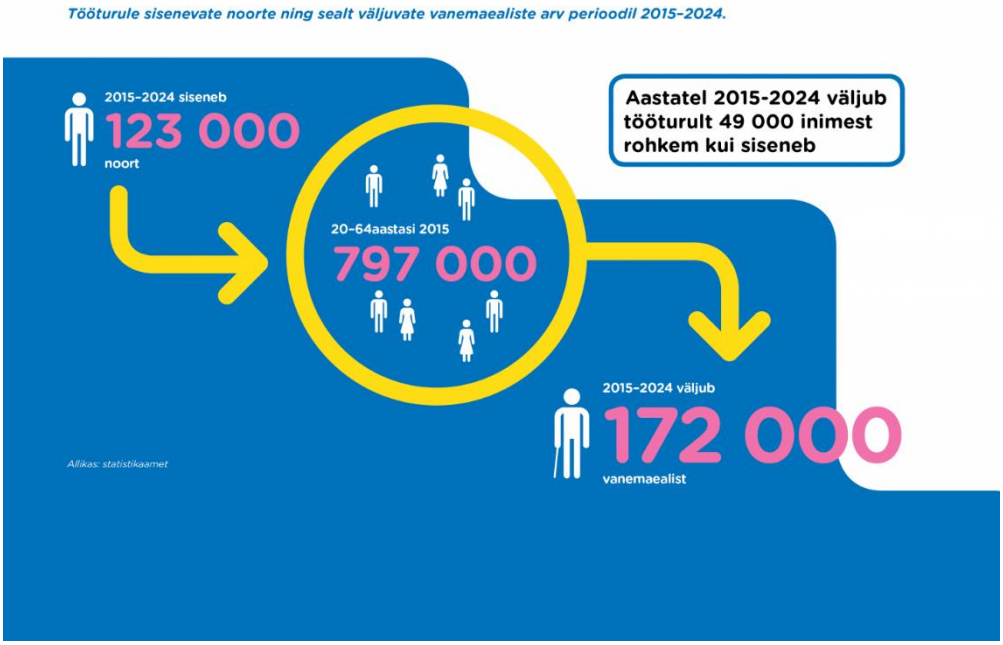
[52] Leppik, M. (2018). Kutse- ja kõrgharidusõpingud lõpetanute edukus tööturul 2016. https://www.hm.ee/sites/default/files/uuringud/edukus_tooturul_marianne_leppik.pdf

[53] Kreegipuu, T., Jaggo, I. (2018). Õpingute jätkamine pärast üldkeskharidust. Tartu: Haridus- ja Teadusministeerium. https://www.hm.ee/sites/default/files/uuringud/keskhariduse_jatk_kreegipuu.pdf

[54] Tark ja Tegus Eesti 2035. https://www.hm.ee/sites/default/files/documents/2022-10/tark_ja_tegus_kogumik_a4_veebi.pdf

[55] https://oska.kutsekoda.ee/uuring/8133-2/

2015-2024 the number of people leaving the labor market is 172 000, and the number of youths entering the market is 123 000. This means the gap is 49 000.



Due to the strict migration policies which the previous and current Government of Estonia is implementing, there is no forecast that all those jobs can be fulfilled by migrants. However, the prognosis did not take into account the impacts of Ukrainian war and slowing down of global economy (partly due to it), and war migrants' factor, so the real gap can be a bit lower.

Currently there is a strong discourse evolving in society about keeping employees longer in the labor market even during their official pension age. Even though, no discrimination based on age, gender, sex is allowed by the labor law the real-life examples prove the opposite. Job seekers already in their early 50s report having been disqualified in the recruitment processes and/or even worse many of them have experienced age discrimination personally.

However, it bears in mind to ask whether and how the aging population and workers are destined and opinionated towards green transition.

When it comes to exact numbers, unfortunately, their green skills lie in cross-sectorial viewpoint and therefore are difficult to do the prognosis.

Although lack of a specific institutional set up on green skills may give the impression that this hinders the systematic development of relevant measures and initiatives, the skills anticipation activities in Estonia are all directly related to the newly launched OSKA system. The OSKA system has a comprehensive approach to skills development: inherently it takes into account developments in the green economy and sustainable development through the advice and knowledge of sectoral experts. It is highly unlikely that an alternative mechanism will be created for specifically green skills development. Thus, most probably, it is essential to find ways to make green jobs and skills more visible in the OSKA system. Cooperation between the public and private sector would greatly promote this goal.

The OSKA system could function as a platform for the development of a common vision on green skills and jobs through the engagement of all relevant stakeholders. This would foster linkages between environmental and labor policies and skills development, as both policy makers and practitioners are involved[56].

In recent years, Estonia has invested substantially in reforming its skills anticipation process, including the newly launched System of Labour Market Monitoring and Future Skills Forecasting (OSKA). That has both improved the involvement of stakeholders and created a systematic process for skills anticipation. However, green economy, green skills and green jobs are not explicitly part of the system and are developed horizontally. In Estonia, green jobs and green skills are spread between different economic sectors and policy areas and there is no coherent training approach or framework.

OSKA carried out a special report on digital and green skills in 2021[57].

The major findings from this report are the following:

• The application of the principles related to the circular economy and the search for its possibility should **be the focus in every economic field** and in cooperation between economic fields (since the problems are often multifaceted). Public administration (including local governments) can contribute through targeted public procurement.

• The **protection and restoration of ecosystems requires special attention in all areas**, including especially in areas of activity involving land use (e.g., forestry, agriculture, construction, urban planning, etc.).

• **Sectors that are displaced by the green revolution** (e.g., oil shale mining) **need additional attention** (retraining of employees, strategic redirection of previous skills to other areas of activity).

• **The choice of specialties for updating the training offer should be based on areas with a more important role and greater impact from the point of view of the green revolution** (e.g., energy, transport, construction, environment, public administration).

• The green revolution requires both **general skills** (e.g., cooperation skills, project management, critical thinking, creativity, entrepreneurship, etc.) as well as **subject-specific** green skills of growing importance (e.g., materials science in environmental curricula).

• **Higher education institutions and vocational education institutions are expected to offer training that supports lifelong learning** (time-flexible learning opportunities, specialization opportunities supplementing basic skills, etc.), which supports the acquisition and renewal of green skills.

• Graduates of level education are expected to have basic knowledge, which can be supplemented within the framework of in-service training for the introduction of new and specific technologies.

• **The implementation of new technology** (e.g., construction of large wind farms, new waste management technologies) requires the provision of specific training (e.g., general

[56] Cedefop: Skills for green jobs: an Update Estonia 2018

[57] https://oska.kutsekoda.ee/uuring/oska-ulevaade-digi-ja-rohepoordeks-vajalikest-oskustest/

environmental management is not enough) based on the trends and forecasts of a specific field of activity.

• At management levels, more general green knowledge is needed (understanding of the green revolution, ability to guide related processes, strategic planning), specialists and skilled workers are expected to be able to further develop and/or apply what they have learned.

• The "updating" of managers' values and knowledge related to green issues is crucial for the processes related to the green turn to start (including the importance of making training sessions attractive for managers).

• It is necessary to increase the number of lecturers/trainers familiar with green topics. In order to motivate trainers, the provision of in-service training in higher education institutions should be taken into account during certification as a part of the lecturer's contribution to serving society.

• In order to **raise awareness of green economy related topics**, universal websites suitable for students of different fields (e.g., environmental communication) can be offered, which would also support the interdisciplinarity necessary for the green revolution (joint seminars, cooperation projects, etc.).

A special study and prognosis were carried out of Eastern Estonia since this region will have the largest impact from green transition. Namely, this is the region where mining of oil shale takes place. It's also where the energy plants producing energy from oil shale are situated. Not to mention, it's the region next to Russia. So, unemployment can lead to threats of security. Also, this region is destined to receive grants from the European Union to help with destabilizing the economy and labor market. According to the study 4000 people will lose their jobs in the mining sector in the upcoming years[58].

The percentage of unemployed female in this region has already been higher than the average of the other parts of Estonia and male have been the sole breadwinners for families. Therefore, a more strategic approach to reskilling and re-training is needed in this region.

In the study carried out by Praxis it is estimated that most of the people who'll lose their jobs in mining will be employed in manufacturing sectors. The special funds support the companies setting up the new factories in the region which are linked to the green economy. However, there is also a chance that some people out of those 4000 will choose to retire and opt out of reskilling opportunity.

On the other hand, currently, due to high energy prices in the global market, the energy production out of oil shale will not be stopped in the near future. Therefore, the closing down of older and outdated energy plants has been postponed.

Considering that the economy has slowed down in other countries Estonian growth will also slow down, because it is heavily reliant on export markets. This means that the Estonian companies' will not be able to or have less money to invest in R&D. However, with a recently founded Ministry of Climate, we can be sure that more integral approach towards climate and green economy will be taken. As a real-life example, the government has initiated the process to create a climate law. Also, all EU directives which urge companies of concrete

[58] Ida-Virumaa majanduse ja tööturu kohandamine põlevkivitööstuse vähenemisega. Praxis 2020.

size/ownership to report on ESG, means there is an increasing demand for professionals who can do it.

Last but not least, the qualification system itself has to be updated more often and on a steady basis since the changes and improvements in sectors and industries are taking place faster and faster.