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THE IMPORTANCE OF GREEN COMPETENCES IN TODAY'S LABOUR MARKET – THE STUDENTS' PERSPECTIVE

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Purpose: The aim of the study is to identify the role of green competences in today's labour market from the perspective of future university graduates.
Design/methodology/approach: The study was preliminary and based on conducting a pilot qualitative study. It focused on green competencies, specifically assessing the awareness of future university graduates regarding environmental changes and the importance of these competencies in the labour market. This article presents selected results of a survey con-ducted among students of the Częstochowa University of Technology.
Findings: There has been a growing interest in green competences in recent years, which has been reflected in a sharp increase in the number of publications referring to this issue. The survey identified students' knowledge of the changes taking place in the labour market as a result of the growing importance of sustainable development. Future graduates defined green competences and assessed their importance for the industry they plan to work in. The general state of students' knowledge of the environmental and climate changes taking place in their environment and the educational needs for developing their green competences were identified.
Research limitations/implications: The main limitation is the small sample size, which restricts generalisation of the results. The sample was not diverse in terms of year of study and discipline, which limited analysis across groups.
Originality/value: The study adds to the existing knowledge on the importance of green competences in the labour market by showing the students' perspective, their opinion on the changes taking place in the labour market, their green competences and educational needs, increasing green competences of future graduates.
Keywords: green competences/skills, sustainability development, green transformation.
Category of the paper: Research paper.

1. Introduction

Increasing environmental challenges such as climate change, ecosystem degradation, and natural resource depletion have accelerated energy transformation processes as well as the development of renewable energy sources and green technologies. Sustainable development has become one of the most important concepts of the first half of the 21st century (Elmqvist

et al., 2019; Sitek, Tvaronaviciene, 2021), with the transformation towards green economies shaping new competences and jobs. The labour market and competences of the future are determined by environmental factors among other things. These include the level of environmental awareness among the population, the development levels of the circular economy and sustainable transportation, the degree of renewable energy source utilisation, and efforts to achieve climate neutrality (Dębkowska et al., 2022a). The shift towards a more sustainable circular economy will impact employment both in quantitative and qualitative terms (skills-wise) (Wegenberger, Ponocny, 2025; Sipa, Sitek, 2024). According to the International Labour Organization (ILO), the transition to a green economy may create millions of new jobs requiring specialist knowledge and skills, more specifically the so-called green competences (International Labour Organization, 2019). In order to achieve sustainability goals, employers from green industries are increasing the demand for employees with green competences. According to the Global Green Skills Report (LinkedIn, 2023), between 2023 and 2024 there was a 7.7% increase in the number of job adverts for positions related to ecology or requiring at least one green skill. According to the World Economic Forum (2020), the development of green competences not only contributes to environmental protection, but also enhances the labour market's resilience to future challenges such as automation and environmental crises. Thus, one of the priorities of labour market policies in many countries is to integrate green competences into education and training systems as well as employment strategies (Zwolińska et al., 2022). Environmental awareness, the ability to use new technologies, and the capacity to manage environmental protection projects raise professional value and increase employability (Cedefop, 2021). Individuals with green skills report an employment rate 54.6% higher than the overall workforce (LinkedIn Economic Graph, 2024).

Green transformation is, and will continue to be, affecting the Polish labour market. It is forecast that by 2030, 300,000 new jobs will have been created in Poland, linked to renewable energy sources, nuclear energy, thermomodernisation of buildings, electromobility, digitisation in a broad sense, and network infrastructure management (Konfederacja Lewiatan, 2022; Ścibich-Kopiec, 2024). Thus, it is necessary to provide future graduates with education that will equip them with appropriate green competences and skills to match the needs of present and future employers operating in green economy sectors (Nikolajenko-Skarbalė et al., 2021). As Wegenberger and Ponocny (2025) stress, identifying and understanding the necessary competences helps determine the demand for skills and facilitates better orientation of individuals and educational establishments.

The growing interest in green competences is evidenced by the increasing number of publications on the subject in recent years. In the Scopus database, the first papers on green competences or skills were recorded in 2012. The largest increase in the number of publications referring to the issue at hand was in 2024, when 89 papers were published. This represents an increase of 56 publications compared to 2023. Mainstream research streams focus on the conceptualisation of green competences, their relevance to sustainable development and

economic transformation, the identification of competency gaps and, to a small extent, the role of vocational and higher education in shaping them. As Urszula Gołaszewska-Kaczan and Julita Augustyńczyk (2025) note, the topic of green competences, in the context of higher education, is not yet widely represented in the academic literature. The vast majority of analyses to date focus on entrepreneurs, managers or employees.

To the best of the Author's knowledge, there are no studies that directly examine the significance of green competences and their development from the perspective of future higher education graduates in Poland, which constitutes a research gap in the context of green competences. Therefore, the main aim of this study was to identify the role of green competences in the current labour market from the perspective of future university graduates. The author conducted an initial verification of students' awareness of the growing importance of the concept of sustainable development and related changes in the labour market, in particular the increased demand for employees with green competences.

Further sections of the study present basic issues related to the addressed subject, an outline of the research concept, as well as the analysis and discussion of the research questions formulated as follows:

P1. Are students aware of the population's impact on the natural environment and what pro-environmental attitudes do they exhibit?

P2. How do young people perceive green competences and are these competences key to the industry in which they wish to pursue their professional careers?

P3. How do they assess their competences in the area of sustainable development?

P4. Would they like to develop green competences – and if so, which ones – in order to meet the growing demands of today's labour market?

The paper concludes with a conclusion.

The results obtained are an important addition to the existing state of knowledge regarding the importance of green competences and their development in the labour market from the students' perspective.

2. Literature review

The literature highlights significant variation in the concept of competences (Serafin, 2016; Mikuła, Domaradzka, 2020). The European Centre for the Development of Vocational Training (Cedefop, 2014) defines competences as the "ability to appropriately use learning outcomes in a particular setting (during study or at work, in professional or personal development) or proven ability to use knowledge as well as personal, social, or methodological skills in work or study situations and in professional career and personal development" (Cedefop, 2014; Sudolska et al., 2023). Mikuła and Domaradzka (2020) state that competences represent skills,

knowledge, personal qualities, and behaviours needed to effectively complete assigned tasks, which are inseparably connected with acting in specific situations. They are also perceived as decision-making powers assigned to specific positions or individuals, arising from formal organisational structures (Serafin, 2016). Furthermore, enhanced employability, personal fulfilment and development, social inclusion, sustainable lifestyles, conscious life management, and active citizenship require key competences. According to the recommendation of the European Council (EU, 2018), key competences are an integrated combination of knowledge, skills, and attitudes. Knowledge constitutes established facts, numbers, concepts, ideas, and theories which facilitate comprehension of a particular subject or field, whereas skills refer to the ability to perform actions and practically apply knowledge to achieve outcomes. Attitudes are understood as willingness and orientation to act or react to ideas, individuals, or situations.

Ismail et al. (2021) stress that it is thanks to employees equipped with knowledge, skills, and competences that enterprises can achieve their established goals and execute strategies. Increasingly, organisations strive to achieve their goals and implement strategies in a sustainable and environmentally friendly manner (Gorzeń-Mitka, 2024). As a result, the labour market is creating more and more so-called green jobs (Kozar, 2020), and green skills are gaining in importance (Antczak, Gajdos, 2023, Ziółkowska, 2024).

The literature lacks a single, widely accepted definition of green competences (Strachan et al., 2022; Kwauk, Casey, 2022; Sudolska et al., 2023). Cabral and Dhar (2019) argued that green competences are a reflexive, multidimensional concept comprising such elements as green knowledge, skills, abilities, attitudes, behaviours, and awareness. They noted that due to the ambiguity of this concept in academia, various terms such as sustainable skills, green skills, pro-environmental competences, and nature conservation competences are used interchangeably. Demssie et al. (2019) claimed that green competences refer to the integration of knowledge, skills, and attitudes that facilitate efforts to maintain human and natural resources required for social, environmental, and economic advancement of present and future generations. According to the OECD (2014), green competences are knowledge, skills, and attitudes necessary for supporting sustainable development, efficiently managing resources, and implementing environmentally friendly technologies. Cabral and Dhar (2021) further argued that green competences are hierarchical dispositional constructs comprising green knowledge, skills, awareness, attitudes, abilities, and behaviours. They include both technical abilities (e.g. renewable energy sources) and soft competences such as environmental awareness, sustainable work practices, and creativity in seeking innovative environmental solutions.

Green competences are most often used interchangeably with the term "green skills", which is also viewed as a broad and not entirely clear-cut concept (Wegenberger, Ponocny, 2025). According to Cedefop (2014), they refer to skills necessary for living in a society striving to reduce the negative human impact on the natural environment. General environmental skills aim at raising awareness and supporting activities that facilitate energy conservation and

promote pro-ecological attitudes. To apply standards and procedures aimed at protecting biodiversity and ecosystems, as well as reducing energy, natural resource, and water consumption, specific environmental (green) skills are required. Specialised environmental skills are utilised in developing and implementing environmentally friendly technologies such as renewable energy sources and recycling processes. According to the United Nations Industrial Development Organization (UNIDO, 2022), green skills comprise knowledge, abilities, values, and attitudes needed to live in, develop, and support a sustainable society that manages resources efficiently. The concept of green skills is often used synonymously with green jobs (Montanari et al., 2023) and sustainability competences (e.g. in GreenComp). As noted by Sudolska et al. (2023), analyses of different ways of conceptualising green competences allow differentiation into three basic elements: knowledge, skills, and attitudes.

The identification and provision of appropriate competences (skills) for green jobs can help harness significant potential for job creation while enabling enterprises and economies to achieve sustainability goals more effectively. However, when employees lack sufficient skills necessary to perform their duties effectively, or when their qualifications do not meet the requirements of a position, a competence gap emerges. This phenomenon also arises when employees have an appropriate level of qualifications yet lack specific types of skills (e.g. management) or experience to execute tasks effectively. The competence gap can occur at the level of an entity, organisation, sector, or at regional, national, and international levels (Cedefop, 2021). Nikolajenko-Skarbalė et al. (2021) note that economies transitioning towards a green economy are facing various challenges. These are determined by factors such as natural resources, the historical level of economic development, or climate conditions. Of equal importance are citizens' attitudes and awareness of the significance of efforts promoting a sustainable and ecological future. The varying levels of these factors indicate that the demand for green abilities and skillsets will differ between economies. According to the Green Skills Report (LinkedIn, 2024), between 2023 and 2024 the global demand for employees with green competences increased by 11.6%, whereas supply rose by 5.6%. Furthermore, the list of 10 countries with the largest gap between demand and supply growth included Poland. The largest gap between demand growth and supply growth of green talents was visible in Portugal, Great Britain, and Costa Rica. In each of these countries, demand is growing much faster than supply. In the case of Poland, this gap is the smallest (Kaura, 2024) (Figure 1).

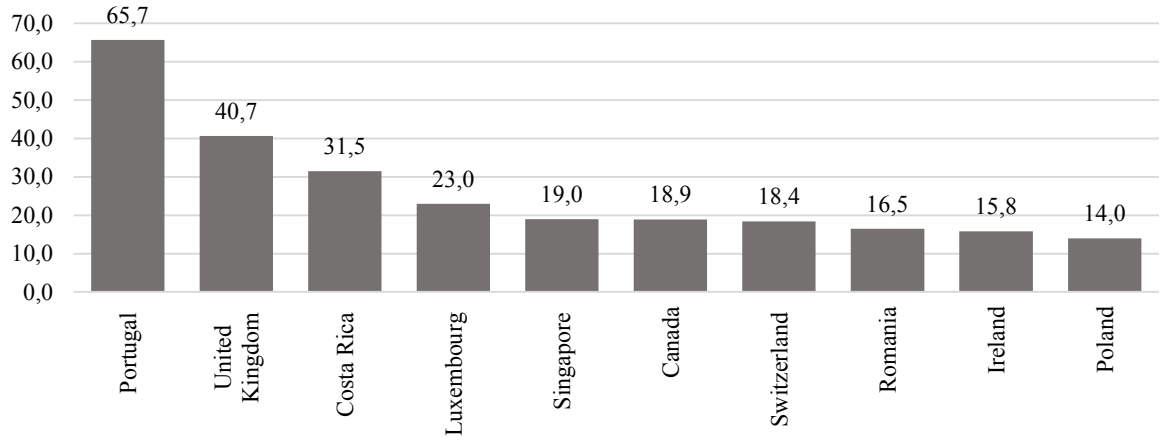


Figure 1. Top 10 countries with the largest gap in green talent demand versus supply growth from 2023 to 2024 (year over year).

Source: Kaura, 2024.

Moreover, it was pointed out that unless the supply of green competences doubles and current market trends remain unchanged, by 2050 the competence gap will have increased to 101.5%, and the achievement of sustainability goals will be at risk (LinkedIn Economic Graph, 2024). Thus, it is imperative to close the competence gap between labour market demand and the development of green competences among future university graduates. As Montanari et al. (2023) state, one possible way to equip employees and students with the knowledge, skills, and awareness necessary for sustainable development is competence-based education and training.

3. Methods

The research took the form of a pilot study. Its main aim was to examine the role of green competences in the current labour market from the perspective of future university graduates. It served as an initial assessment of students' awareness. Data for the pilot study were collected using a structured questionnaire that included questions on students' knowledge, skills, and attitudes towards sustainable development, with particular emphasis on the growing importance of green competences in shaping the labour market. For questions that required respondents to evaluate a particular issue, a five-point Likert scale was employed. The study was conducted in May 2025. This paper presents a preliminary assessment of students' awareness of the growing significance of sustainable development and related labour market changes, particularly the increasing demand for employees with green competences. The conclusions are based on statistical analyses of basic descriptive statistics, carried out using Microsoft Excel and Statistica 13. In total, data from 198 correctly completed questionnaires were analysed. The respondents were students of Częstochowa University of Technology.

4. Results and Discussion

The majority of the respondents were female (61.11%). Males accounted for 38.38%, and one person refused to answer the question related to sex. The overwhelming majority of the research sample were first-year students (80.30%). Fifth-year students accounted for 16.67%, while the remaining respondents were third- and fourth-year students. The research sample was dominated by students of economic studies (87.88%). Every tenth respondent was a student of technical subjects, while 1.52% studied natural sciences (Table 1).

Table 1.
Research sample characteristics (*N* = 198)

Category	Subcategory	*N*	%
Sex	Female	121	61.11
	Male	76	38.38
	I prefer not to answer	1	0.51
Study year	1st year	159	80.30
	2nd year	3	1.52
	3rd year	3	1.52
	5th year	33	16.67
Study type	Natural sciences (e.g. Biology, Chemistry, Geography, Physics)	3	1.52
	Technical: (e.g. Engineering, Information Technology, Architecture)	21	10.61
	Economic studies (e.g. Management, Finances, Economics)	174	87.88

Source: own study.

Respondents evaluated their knowledge and skills in the field of natural environmental protection and ecology. Table 2 presents selected descriptive statistics. The analysis of the data revealed that the respondents evaluated their awareness of the human impact on the environment as high (average 4.08). However, agreement with the statement "Each of us has an impact on the natural environment" was lower, with an average rating of 3.88. It is worth noting that in the case of awareness of the human impact on the environment, 78.79% of respondents rather agreed or definitely agreed with the statement, while only 7.58% rather disagreed or definitely disagreed. For the statement "Each of us has an impact on the natural environment", the percentage of respondents who rather disagreed or definitely disagreed was higher (12.12%). What is concerning is that despite relatively high awareness of the human impact on environmental change, one third of respondents rather did not feel or definitely did not feel responsibility for environmental protection, while 31.82% had no opinion on the issue. Furthermore, the respondents generally did not promote engagement in environmentally friendly activities (average 2.52). Half of them rather or definitely did not promote such behaviours, and only 18.2% engaged in promoting eco-friendly attitudes. This result confirms the observations of Montanari et al. (2023), pointing to the phenomenon of declarative environmentalism - however, knowledge of environmental problems does not always translate into specific action.

Table 2.
Protection of the natural environment and ecology – evaluation of students' skills and knowledge

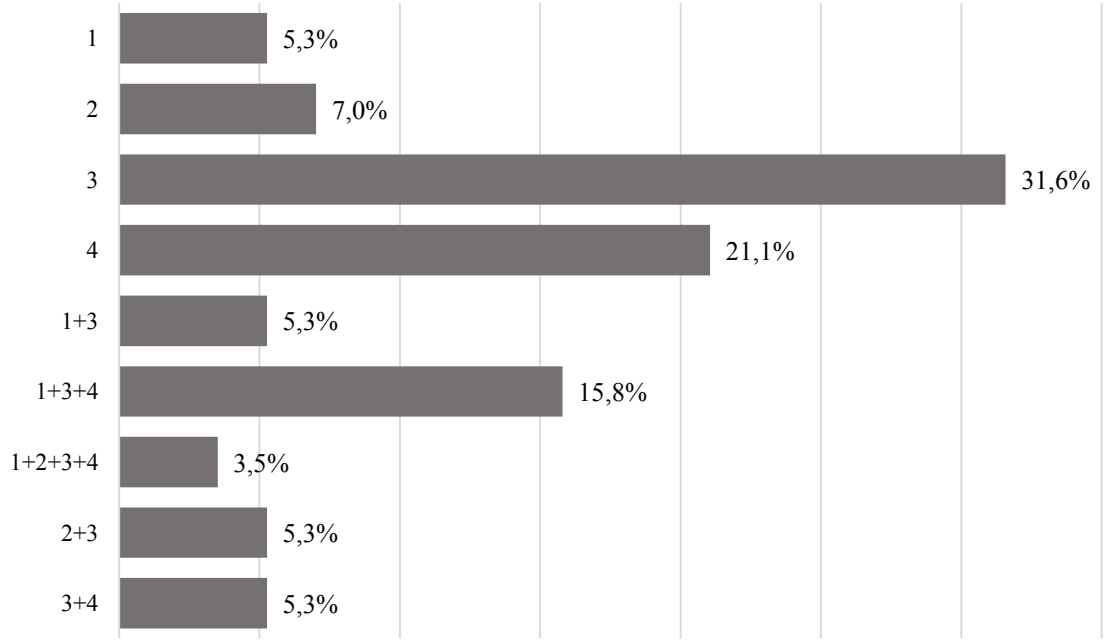
	Selected statistics						
	N	**Average**	**Median**	**Mode**	**Number of modes**	**Minimum**	**Maximum**
I am aware of the human impact on the natural environment	198	4.08	4	Multiple	78	1	5
I think that each of us has an impact on the state of the natural environment	198	3.88	4	4	75	1	5
I feel responsibility for the protection of nature	198	2.98	3	3	63	1	5
I can indicate the main causes of global warming	198	3.62	4	4	72	1	5
I know the basic environmental concepts (e.g. carbon footprint)	198	3.38	3	4	63	1	5
I follow news and articles connected with ecology	198	2.65	3	3	66	1	5

KEY: 1 – I definitely disagree; 2 – I rather disagree; 3 – I have no opinion; 4 – I rather agree; 5 – I definitely agree.

Source: own study.

Regarding knowledge of basic issues related to environmental protection and climate change, respondents were asked to evaluate their knowledge of key environmental concepts and the main causes of global warming, as well as to indicate whether they increased their knowledge in this area by following news related to ecology. The study revealed that over half of respondents (56.06%) were able to indicate the main causes of global warming, while almost one third had no opinion. The average rating in this category was 3.62. Knowledge of environmental concepts was rated slightly lower (average 3.38). This resulted partly from a relatively high percentage of "rather or definitely disagree" responses (22.73%) and fewer respondents (48.48%) indicating familiarity with environmental concepts. Nearly half of respondents (46.97%) did not follow any news related to ecology, while one third had no opinion. The average rating for this statement was 2.65.

The analysis of the data revealed that the overwhelming majority of students were not familiar with the concept of green competences. Only 28.79% (n = 57) indicated familiarity. Most of these respondents understood green competences as "practical skills connected with environmentally sound management" (98.25%) or "ability to act in support of sustainable development" (45.61%). Respondents were allowed to select several descriptions of the concept. The most frequently selected combination was "knowledge about climate change and its results", "practical skills connected with environmentally sound management", and "ability to act in support of sustainable development", chosen by 15.79% of respondents (Figure 2 presents the detailed distribution of responses).



Note:
1. Knowledge about climate change and its results.
2. Knowledge of the principles of a circular economy.
3. Practical skills connected with environmentally sound management.
4. Ability to act in support of sustainable development.

Figure 2. Understanding the concept of "green competences" (*n = 57*).

Source: own study.

The results show that despite the growing role of green competences in the economy (ILO, 2019; LinkedIn, 2023; Wegenberger, Ponocny, 2025), the terminology remains little recognised among students. Such a high percentage of people unfamiliar with the concept of "green competences" may be indicative of a gap in formal education that has not kept up with European standards.

The study also examined the extent to which students engaged in energy conservation, plastic reduction, or the use of renewable energy sources. The analysis showed that 63.64% saved electricity and water at home, 40.91% attempted to reduce plastic use in daily life, 39.39% chose local and seasonal products, and 37.88% used renewable energy sources such as photovoltaics or wind energy (Table 3).

The analysis revealed that over half of respondents (58.59%) noticed the growing importance of competences connected to environmental protection and sustainable development in the labour market, whereas 12.63% did not perceive this trend. Nearly three out of ten respondents indicated that they had no knowledge of the issue.

The study further indicated that students perceived the industries in which they anticipated pursuing future careers as requiring competences in environmental protection and sustainable development only to a limited extent. Only 7.58% of respondents reported that their chosen industry demanded such competences to a very large extent, while 15.15% believed they were required to a large extent. The average rating was 2.73 on a five-point Likert scale. These results

diverge significantly from the views of Irish students, who overwhelmingly (92%) agree or strongly agree that green skills are necessary to meet environmental challenges across industries (da Costa et al., 2025).

Table 3.
Students' attitudes towards activities promoting environmental protection

	Selected statistics						
	N	**Average**	**Median**	**Mode**	**Number of modes**	**Minimum**	**Maximum**
I save electricity and water at home	198	3.68	4	4	87	1	5
I choose local and seasonal products	198	3.21	3	3	75	1	5
I try to reduce my use of plastic in daily life	198	3.09	3	4	57	1	5
I encourage others to engage in environmentally friendly activities	198	2.52	2.5	3	63	1	5
I use renewable energy sources (e.g. photovoltaics, wind energy)	198	2.80	3	1	60	1	5

KEY: 1 – I definitely disagree; 2 – I rather disagree; 3 – I have no opinion; 4 – I rather agree; 5 – I definitely agree.

Source: own study.

Even lower ratings were recorded regarding the necessity of possessing green competences in future professional careers. Green competences were regarded as important by 1.52% of respondents and very important by 12.12%. Furthermore, one in five respondents considered green competences unimportant for their career. The results obtained are in line with those carried out among Generation Z, in whose opinion green competences are not crucial for their career development (Kozara, 2025). The low percentage of students perceiving the growing importance of green competences in the labour market contradicts forecasts indicating a dynamic growth in demand for such skills (Kaura, 2024; Polish Confederation Lewiatan, 2022; LinkedIn Economic Graph, 2024). This suggests, among other things, the existence of an information gap that may lead to a mismatch between the qualifications of graduates and the requirements of a sustainable economy. Furthermore, the fact that students of economics (who make up the majority of the sample) recognise that their future industry requires little in the way of such skills may suggest that they perceive "green competence" narrowly - as the domain of environmental engineers - overlooking the key role of sustainable finance, ESG reporting or green supply chain management, which are now a priority in the business sector.

Respondents also evaluated the importance of specific skills related to sustainable development for their future career paths. Table 4 presents selected descriptive statistics, while table 5 – the distribution of the responses. On a five-point Likert scale, "system and long-term thinking" was ranked highest, with an average of 3.65 and 62.1% rating it as important or very important. The median and mode for this variable were 4. Higher ratings were also given to "acting in the face of uncertainty" (3.47) and "cooperation for the promotion of sustainable development" (3.26). The least important, according to respondents, were the ability to predict

the outcomes of environmental activities (2.88) and knowledge of circular economy principles (2.97).

Table 4.
Evaluation of the usefulness of green competences in students' future professional careers – descriptive statistics

	Selected statistics						
	N	**Average**	**Median**	**Mode**	**Number of modes**	**Minimum**	**Maximum**
System and long-term thinking	198	3.65	4	4	75	1	5
Predicting the outcomes of environmental activities	198	2.88	3	3	60	1	5
Knowledge of the principles of a circular economy	198	2.97	3	3	66	1	5
Communication skills connected to environmental issues	198	3.00	3	3	63	1	5
Cooperation for the promotion of sustainable development	198	3.26	3	3	72	1	5
Acting in the face of uncertainty	198	3.47	3	3	72	1	5

Source: own study.

Self-assessment of competences and preferences for their development indicate that students rate soft skills such as systems thinking or responsibility for actions taken better, which is in line with the GreenComp approach (European Commission, 2022). More technical areas, such as the circular economy, are rated lower, which may be due to limited exposure to this subject matter in earlier stages of education.

Table 5.
Evaluation of the usefulness of green competences in students' future professional career – distribution of the responses

	Ratings					Total
	1	**2**	**3**	**4**	**5**	
System and long-term thinking	6.1%	9.1%	22.7%	37.9%	24.2%	100%
Predicting the outcomes of environmental activities	15.2%	22.7%	30.3%	22.7%	9.1%	100%
Knowledge of the principles of a circular economy	13.6%	19.7%	33.3%	22.7%	10.6%	100%
Communication skills connected to environmental issues	12.1%	22.7%	31.8%	19.7%	13.6%	100%
Cooperation for the promotion of sustainable development	9.1%	13.6%	36.4%	24.2%	16.7%	100%
Acting in the face of uncertainty	7.6%	7.6%	36.4%	27.3%	21.2%	100%

Source: own study.

The failure of students to notice the growing importance of green competences in the labour market was confirmed by responses to the question: Can the lack of green competences impact your employability? Nearly 40% believed the lack of such competences was irrelevant, 43.94% did not know whether such a relationship existed, and only 16.67% believed the lack of green competences could impact employability.

Students also self-assessed their green skills, with 1 signifying a very low level and 5 a very high level. The students rated their skills as moderate. The median for six out of seven variables was 3, and the average did not exceed 3.48. Table 6 presents selected descriptive statistics, while table 7 presents the distribution of the responses. "Responsibility for actions taken" was

rated highest (3.48 on a five-point Likert scale), with a median of 4, and 56.1% rating it high or very high.

Table 6.
Self-assessment of green competences – descriptive statistics

	Selected statistics						
	N	**Average**	**Median**	**Mode**	**Number of modes**	**Minimum**	**Maximum**
System and long-term thinking	198	3.32	3	4	72	1	5
Predicting the outcomes of environmental activities	198	2.94	3	3	87	1	5
Knowledge of the principles of a circular economy	198	2.73	3	3	78	1	5
Communication skills connected to environmental issues	198	2.86	3	3	78	1	5
Cooperation for the promotion of sustainable development	198	3.08	3	3	72	1	5
Acting in the face of uncertainty	198	3.15	3	3	81	1	5

Source: own study.

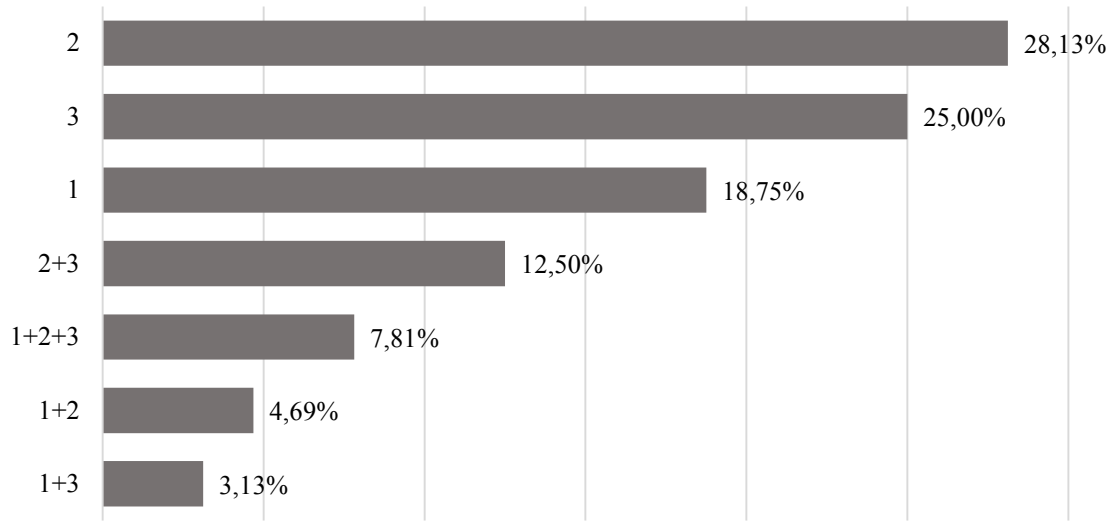
Skills rated below average included "predicting the outcomes of environmental activities" (2.94), "communication skills connected to environmental issues" (2.86), and "knowledge of the principles of a circular economy" (2.73).

Table 7.
Self-assessment of green competences – structure of the responses

	Ratings					Total
	1	**2**	**3**	**4**	**5**	
System and long-term thinking	3.0%	19.7%	30.3%	36.4%	10.6%	100.0%
Predicting the outcomes of environmental activities	7.6%	24.2%	43.9%	15.2%	9.1%	100.0%
Knowledge of the principles of a circular economy	15.2%	22.7%	39.4%	19.7%	3.0%	100.0%
Communication skills connected to environmental issues	13.6%	21.2%	39.4%	16.7%	9.1%	100.0%
Cooperation for the promotion of sustainable development	10.6%	18.2%	36.4%	22.7%	12.1%	100.0%
Acting in the face of uncertainty	4.5%	19.7%	40.9%	25.8%	9.1%	100.0%

Source: own study.

The overwhelming majority of respondents expressed a desire to develop green competences, with only six showing no interest. The most frequently indicated form of development was practical workshops (28.13%), followed by projects and internships in sustainability-oriented companies (25%), and e-learning courses (18.75%). Other respondents indicated various forms. (Figure 4) The choice of workshops, projects and internships by students as methods of developing green competences confirms that practical forms of development are the most effective, which is in line, for example, with the recommendations of the OECD (2014) or the opinion of Montanari et al. (2023).



Note:
1 - E-learning courses.
2 - Practical workshops at university.
3 - Projects and internships in sustainability-oriented companies.

Figure 4. Preferred forms of developing green competences.

Source: own study.

The indications of the students surveyed are consistent with the findings of international research, which has shown that students in Ireland feel overwhelmed by theory and insufficiently prepared for the practical implementation of sustainability strategies in the workplace (da Costa et al., 2025).

Students also indicated which competences they would like to develop further, measured using a five-point Likert scale (1 = no need; 5 = strong need). All averages were above 3, ranging from 3.18 to 3.74. The greatest need was expressed for developing system and long-term thinking (3.75), responsibility for actions taken (3.73), and ability to act in the face of uncertainty (3.71). The least demand was for predicting the outcomes of environmental activities (3.18). Table 8 presents selected descriptive statistics.

Table 8.
The need to develop green competences – descriptive statistics

	Selected statistics						
	N	**Average**	**Median**	**Mode**	**Number of modes**	**Minimum**	**Maximum**
System and long-term thinking	198	3.74	4	5	78	1	5
Predicting the outcomes of environmental activities	198	3.18	3	3	66	1	5
Knowledge of the principles of a circular economy	198	3.23	3	3	54	1	5
Communication skills connected to environmental issues	198	3.42	3,5	4	66	1	5
Cooperation for the promotion of sustainable development	198	3.50	3	3	63	1	5
Acting in the face of uncertainty	198	3.71	4	5	63	1	5
Responsibility for actions taken	198	3.73	4	5	63	1	5

Source: own study.

A comparative analysis of students' self-assessed green needs and their declared needs for further development (Figure 5) indicated that the competences receiving the lowest ratings did not coincide with those in which students expressed the greatest interest in further development.

Figure 5. Evaluation of existing green competences versus students' willingness to develop them. Source: own study.

Respondents mainly wished to enhance skills such as system and long-term thinking and responsibility for actions taken, which they also considered most important for their future careers.

5. Conclusions

Current economic transformations, as well as enterprises' efforts to comply with sustainable development principles, including the Paris Agreement, are key determinants of labour market changes, including the shift in competence profiles towards greener skills. Research into competences related to green jobs assists in identifying competence gaps and sheds light on the most important trends shaping the future of employment. The analysis allowed a preliminary verification of university students' awareness of the growing importance of sustainable development and related labour market changes, in particular the demand for employees with green competences. In the study, the majority of students declared high awareness of human

impact on the environment, but only 68% felt personal responsibility for its protection. Furthermore, only a small percentage actively promoted environmental activities, and engagement in actions such as energy saving, plastic reduction, or buying local products was moderate. This highlights a gap between students' knowledge and its application in practice.

Few students were familiar with the concept of green competences, most often understanding it as practical skills related to environmentally sound management. Although over half noticed the growing demand for such competences in the labour market, only one in five considered them important or very important in their chosen industries. Moreover, four in ten thought the lack of green competences would not affect employability. Students rated their green skills as moderate. Responsibility for actions taken and system thinking were rated highest, while circular economy knowledge and environmental communication were lowest. System and long-term thinking was the competence students most wished to develop, followed by acting in the face of uncertainty and cooperation for sustainable development. Less interest was expressed in developing the skill of predicting the outcomes of environmental activities and knowledge of the circular economy.

Thus, the results of the study indicate an urgent need for a revision of the curricula, especially in faculties that are not directly associated with ecology, energy technology or environmental protection. It is also necessary to intensify efforts to raise awareness of the importance of pro-environmental competences in present-day's labour market.

Universities should actively counter the misconception among students that green competences are of marginal use in their careers. In this context, it is particularly important to integrate sustainability content more widely into curricula, e.g. by including at least one sustainability-related module or practical assignment in each field of study. In addition, students' sense of agency needs to be increased, moving from knowledge-based education to action- and problem-based learning. In this area, the campus can, for example, be used as a space for environmental projects.

In response to the need for students to gain practical experience, universities should strengthen cooperation with local businesses, in terms of co-designing educational programmes, mentoring, internships or joint competence examinations. Developing microcredentials and short certification pathways linked to the European Qualifications Framework (Storonyanska et al., 2025) may also be an interesting solution. They increase the availability of expertise, lower barriers to entry and provide the flexibility important from a student perspective.

In addition, the standardisation and measurement of green competences by higher education institutions would make it possible to include the student's green competence in the diploma supplement. As a result, this would make it easier for graduates to cooperate with the labour market. Simultaneously, universities should invest in developing the competences of their

teaching staff, especially in terms of activation methods and practical tools used in green sectors of the economy.

In conclusion, it should be stressed that this was a pilot study aimed at verifying the research design and providing a preliminary exploration of the phenomenon. The project is not free from shortcomings. Random sampling was not applied due to the research issues and subject. The main limitation is the small sample size, which restricts generalisation of the results. The sample was also not diverse in terms of year of study and discipline, which limited analysis across groups. A more varied sample would allow comparative insights and more in-depth interpretation. Moreover, given known gender differences in environmental perceptions, future studies should consider comparative analysis by sex.

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