

# SUSTAINABLE EDUCATION FOR A SUSTAINABLE FUTURE: INCORPORATING GREEN SKILLS IN HIGHER EDUCATION

*Jurgita LIEPONIENĖ, Diana MICEVIČIENĖ, Gediminas SARGŪNAS*

*Panevėžio kolegija/ State Higher Education Institution*



**Abstract.** The relevance of sustainability in today's ever-changing world has reached new heights. With the increasing severity of global challenges like climate change, resource depletion, and environmental degradation, it is crucial to provide future generations with the necessary knowledge and skills to tackle these urgent issues. Higher education institutions play a crucial role in shaping students' perspectives and preparing them for what lies ahead. Therefore, integrating green skills into higher education is a vital step towards promoting sustainable development. This paper examines the concept of green skills, emphasizes the significance of sustainable education and the incorporation of green skills in higher education, assesses the importance of the 3LoE project in fostering the development of green skills, and showcases the findings of a study that evaluates the relevance of green skills for employers.

**Keywords:** green skills, sustainability, higher education

## INTRODUCTION

In today's rapidly changing world, the need for sustainability has become more crucial than ever. As global challenges such as climate change, resource depletion, and environmental degradation continue to escalate, it is imperative to equip future generations with the knowledge and skills necessary to address these pressing issues. Higher education institutions play a vital role in shaping the minds of students and preparing them for the future (Moscardini et al., 2020). Hence, incorporating green skills into higher education is an essential step towards fostering sustainable development.

This paper focuses on the concept of sustainable education for a sustainable future, with a specific emphasis on the integration of green skills in higher education. Green skills encompass a range of knowledge, competencies, and values necessary to understand and address environmental challenges effectively. By incorporating these skills into various courses and study programmes, higher education institutions can empower students to become agents of change and contribute to the transition towards a more sustainable society. The comprehensive provision of green skills is a key priority of 3LoE project - Three-level centres of professional excellence: qualification, entrepreneurship and innovation in the green economy. The project is 80 percent funded by the Erasmus+ Education programme. The members of the Hanse Parliament, 50 chambers, SME associations, vocational schools and further education institutions from 13 countries and 24 colleges and universities from 7 countries are supporters of the project.

**The aim of the research:** investigate the incorporation of green skills into higher education curricula with the goal of promoting sustainable education for a sustainable future. The objectives of the research: 1. To present the concept of green skills. 2. To highlight the importance of sustainable education and the integration of green skills in higher education. 3. To review the importance of the 3LoE project in green skills development. 4. To discuss the outcomes of a study that assessed the value of green skills to employers and should be fostered by higher education institutions.

**Research methods:** analysis of scientific literature, questionnaire.

The rest of this paper is structured as follows. Section 1 of this article explores concept of green skills. Section 2 analyzes sustainable education and the relevance of green skills in higher education. Section 3 presents 3LoE project - Three-level centres of professional excellence: qualification, entrepreneurship and innovation in the green economy and its importance in green skills development. Section 4 presents the results of a conducted study aimed at assessing the importance of individual green skills for employers. Finally, Section 5 presents conclusions.

## GREEN SKILLS CONCEPT: LITERATURE REVIEW

The idea of green skills has arisen as a critical element in the transition towards a sustainable future in the face of escalating environmental issues and the urgent need to battle climate change. Concerns about climate change are being addressed globally, and efforts are being made to switch to zero- or low-carbon energy systems (Minnini & Hiteva, 2023). As in the past ten years, there have been significant efforts made throughout the world (IRENA, 2019; UNFCCC, 2015 etc.) to combat climate change and move towards low- or net-zero carbon energy systems Bray, Montero, Ford (2022) note. This transformation will impact millions of people needing to upgrade their skills and have highly in-demand abilities so called green skills. Since the development of green technology, the phrase green skills have been popular (Minnini & Hiteva, 2023). People with green skills may handle environmental problems, promote sustainable practices, and successfully contribute to the green economy in a variety of industries. Even though there is no one definition of green skills, they can be broadly defined as a combination of technical, social, and personal competencies that empower individuals to understand, protect, and enhance the environment. They are the skills needed by the workforce, in all sectors and at all levels, to help the products, services, and processes adapt to the changes due to climate change and to

environmental requirements and regulations, according to CEDEFOP. The greening of the economy will require new skills, competencies, and qualifications linked to the creation of new markets and activities which can be largely acquired through on-the-job retraining (White, Bradley, Packer & Jones, 2022). These abilities are sometimes used interchangeably with other phrases like climate emergency skills and decarbonization skills, and they are related to those needed by STEM (science, technology, engineering, and math) employment, Minnini & Hiteva (2023) emphasize. Green skills often consist of three aspects when combined, notably *knowledge* (cognitive dimension), *skills/abilities* (psychomotor dimension), and *attitudes/values* (affective dimension) needed by workers to promote sustainable development (Sern, Zaimė & Foong, 2018). Knowledge of environmental preservation may be seen as a component of green skills from a cognitive perspective. From a psychomotor standpoint, a green skill is the capacity to, say, limit energy usage or lessen greenhouse gas emissions. The term green skills also refers to an emotional component, such as the drive to protect the environment.

Depending on the responsibilities and tasks, different sectors frequently need certain skills. Academic literature suggests that there is disagreement over the quantity and kind of essential green skills training. There are two categories of green skills, *technical and general*, according to the findings. According to White et al. (2022), technical green skills are hard skills that include the competencies required for the design, construction, and evaluation of technology tasks often performed by engineers and technicians. General skills are necessary for achieving organizational and cultural change quickly and guaranteeing the effectiveness of green initiatives: project management, change management, leadership, education management, and communication skills.

More specifically, Sern & et al. (2018) note that recognized green SKILL also include *design, leadership, management, city planning, landscaping, energy, finance, procurement, waste management, and communication*. Particularly, the ability to design is recognized as a crucial green skill since it is used in numerous industries, including architectural design, machine design, and circuit design. In addition, management and leadership abilities are crucial since they are required to alter the organizational structure, operation, and function to support green initiatives like lean manufacturing or life-cycle management. City planning and landscaping expertise are also regarded as two of the most crucial green skills for the present and the future. Another essential green skill, according to Sern & et al. (2018) is the ability to manage energy. To limit the use of non-renewable resources in energy production and consumption, as well as to replace those with ones that are safer and more environmentally friendly. Financial competencies are seen as green since they balance the revenue and duty for environmental protection, an organization's expenditures must be under control (Krechovská, 2015). In the context of green industries, procurement expertise is crucial to ensuring that the materials acquired are eco-friendly to limit the environmental effect throughout their life cycle (Bohari & Xia, 2015). The capacity to minimize, reuse, and recycle garbage via effective design, execution, and coordination of waste management systems is referred to as waste management expertise Sern & et al. (2018) conclude. The term communication skill refers not only to the ability required for verbal and non-verbal communication but also to technological communication skills that reduce energy consumption and lean more towards environmentally friendly communication methods. Pavlova (2015) insists that these generic green skills, which are crucial for the greening of all industries and must be developed in all institutions of higher education.

## SUSTAINABLE EDUCATION AND GREEN SKILLS IN HIGHER EDUCATION

Employers are beginning to search for individuals with green abilities in addition to technical and general skills, which are crucial for promoting sustainable growth in the social, economic, and environmental spheres. The economy, society, and higher education have not given this issue enough attention even though the green industries require employees with green skills. Education and training are essential for the creation of a skilled and educated green workforce. Higher education institutions (HEIs) have a specific obligation to the future and to advance the development of a sustainable society. During the last two decades, HEIs have been incorporating sustainability into their systems (Lozano et al., 2021). Building a sustainable future depends on incorporating green skills into formal education curriculum, vocational training programmes, and professional development activities (Pirzada, G., Naz, M., & Jamil, M., 2023). Institutions of higher learning must provide their students with the skills and information necessary for a thorough comprehension of the complicated situations they will encounter after graduation. They must master certain skills related to sustainable development (Finnveden & Schneider, 2023). What should be taught to students about sustainable development is still an issue that requires discussion, the authors stress as far as there does appear to be a disconnect between acquired skills and industry demands. Moreover, there isn't enough research describing the sustainability skills that industry representatives need.

Several authors have suggested lists of competencies related to education for sustainability and their usage in recent years. The green skills were listed in the chapter above but the essence Finnveden & Schneider (2023) note is how satisfied industries are with the sustainability skills available in candidates on the job market. The overall response was that while there are good and adequate levels of professionals in this subject, there is still a need for an evolution towards more universally accepted understanding of sustainability challenges. Here are a few examples of answers to the query of what kinds of skills need to be further developed: *acquire how to effectively acquire and process new knowledge; sustainability in all topics* (sustainability has to be broadly embraced); *knowing how sustainability concerns relate to and impact company* (risks, opportunities, financial ramifications), as well as having the *capacity to communicate and work with individuals* from diverse cultural backgrounds, languages, and open minds. As a result, there was a strong desire to have instruction for these abilities substantially integrated into all university courses. There was a focus on

improving the integration of these themes into the existing university curricula. Another idea was to collaborate with businesses, NGOs, and universities to create courses that would focus on real-world issues. A truly comprehensive sustainable education requires an interdisciplinary approach. Higher education institutions should encourage collaboration among various departments and faculties to develop cross-cutting courses and research projects. The importance of having interdisciplinary courses was also stressed (Finnveden & Schneider, 2023, p. 4). By breaking down traditional silos, students can gain a broader understanding of sustainability issues and develop innovative solutions that address complex challenges from multiple perspectives. A few of the goals also included: discussing real-world examples and developing thorough business cases; understanding and managing relationships with stakeholders; understanding various organizations and initiatives in the sustainability field; and being able to reflect on the subject taught in relation to sustainable practices. To successfully implement sustainable education and green skills, higher education institutions must invest in faculty development and research. Educators need to be well-versed in sustainability principles and teaching methodologies that promote active learning and critical thinking. Encouraging research on sustainability topics not only expands the knowledge base but also fosters a culture of innovation and continuous improvement within the institution (Nölting, Molitor, Reimann, Skroblin & Dembski, 2020). As companies put more emphasis on these skills, more conversation is needed about the abilities that all prospective managers and experts need as well as the competencies that should be widely included in the HEI's curriculum.

## **THE IMPORTANCE OF THE 3LOE PROJECT IN GREEN SKILLS DEVELOPMENT**

The 3LOE project (code No. 620870-EPP-1-2020-1-DE-EPPKA3-VET-COVE), which stands for Three-Level Centres of Professional Excellence: Qualification, Entrepreneurship, and Innovation in the Green Economy, is crucial to advancing the development of green skills and fostering a society that is more environmentally conscious and sustainable. Panevėžio kolegija/State Higher Education Institution participates in this project. A primary priority of 3LoE is the full provision of green skills. The 3LoE creates Centres of Vocational Excellence on the Green Economy and implements a wide variety of vocational education, training, and higher education initiatives involving the green economy, digitization, and entrepreneurship to address the issues of energy, climate, and environmental protection (<https://3-loe.eu/>). The goals pursued are: to strengthen the competitiveness of SMEs in the green economy by upgrading skills sustainably, securing the need for young professionals/managers, and encouraging young entrepreneurs; realize energy savings, employ renewable energy sources, and safeguard the environment and the climate through skilled and creative SMEs. The expected results include the following: the implementation of dual vocational training in higher education, training, and education, with close cooperation between the learning environments (businesses and centres); the creation of long-term partnerships between centres of excellence and SMEs that are planned out and permanently safeguarded by chambers; and the improvement of SME managers' and professionals' abilities in green economy activities, including fostering green economy entrepreneurship and securing green economy jobs. For this reason, The "3LOE" significantly contributes to green skills development in these ways:

- Comprehensive skill development: offer comprehensive training programs and courses tailored to the needs of the green economy by integrating green skills development into formal education curricula from an early stage;
- Promoting sustainable entrepreneurship: by offering support, mentorship, and resources, aspiring green entrepreneurs can develop the skills and knowledge required to create and run environmentally friendly businesses;
- Addressing skill gaps: identify these gaps and design targeted training programs to bridge them;
- Hands-on learning and practical experience: allows learners to gain valuable experience and become better prepared for the challenges of the green economy;
- Networking and Collaboration Opportunities: serve as hubs for networking and collaboration among professionals, entrepreneurs, researchers, and industry experts in the green sector.

## **RESULTS OF THE STUDY**

The pilot study was conducted with the primary aim of enhancing comprehension regarding the implementation of green skills practices in enterprises and their significance in fostering sustainability and environmental responsibility. Research design: this study employed quantitative data collection method. Structured questionnaires were distributed to employees and management in selected enterprises to measure the extent of green skills practices implementation and their perceived impact. The sampling strategy was purposive, selecting enterprises known for their commitment to sustainability and green skills practices. Employee and management participants were chosen from different departments within these enterprises to ensure diversity. Survey questionnaires were developed based on established scales for measuring green skills practices and environmental responsibility. Anonymity and confidentiality of participants were maintained throughout the study. The research criteria for this study aligned with the following research objectives: 1. To assess the extent of implementation of green skills practices in enterprises. 2. To examine the perceived significance of green skills practices in fostering sustainability and environmental responsibility within enterprises 3. To explore the challenges and barriers faced by enterprises in implementing green skills practices. 4. To identify the collaboration areas in creating green skills with higher education institutions. The research enlisted the participation of 47 companies situated in the Panevezys region. Among these enterprises, 11 percent were identified as large companies, 42 percent as medium-

sized companies, and 47 percent as small companies, as illustrated in Figure 1. Remarkably, a majority of the participating companies, accounting for 47 percent, were primarily engaged in manufacturing as their main business activity.

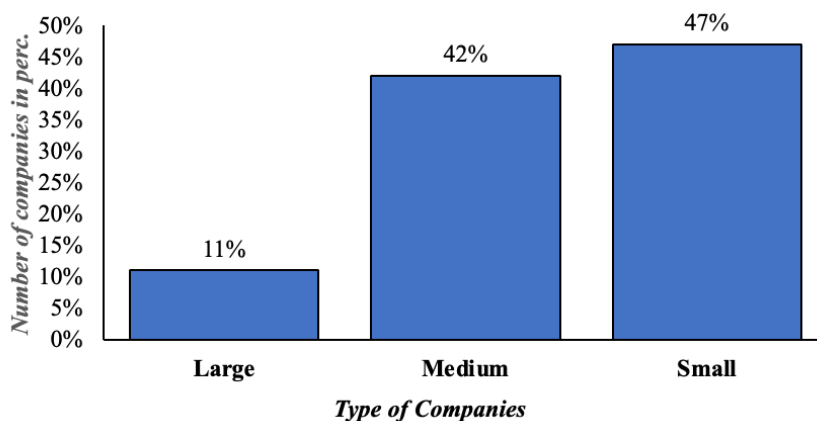


Figure 1. Distribution of companies by size

In the research survey, the enrolled companies were requested to assess their degree of acquaintance with the notion of green skills and their pertinence to sustainability practices in business. The evaluation was conducted on a five-point scale, where a score of 1 denoted a complete lack of knowledge about green skills and their correlation with business sustainability, while a score of 5 indicated a comprehensive familiarity with green skills and their significant role in fostering sustainability practices within enterprises. After conducting the research, it was determined that larger companies slightly better evaluate their knowledge related to the concept of green skills and their significance in promoting sustainability practices in companies (see Figure 2).

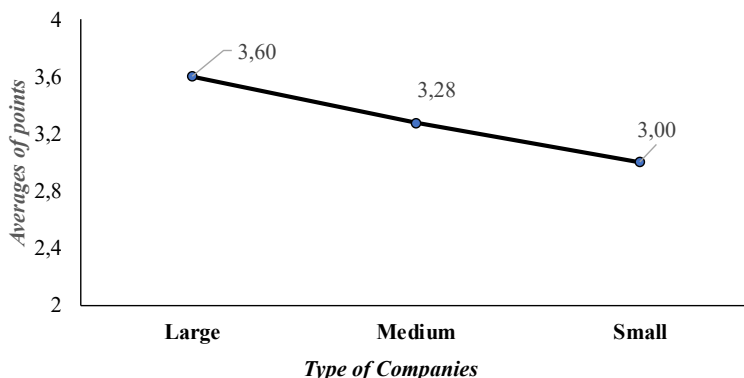


Figure 2. Familiarity of companies with the concept of green skills and their relevance to sustainability practices in businesses

The surveyed companies identified the following as the most important green skills: energy efficiency (87 percent), sustainable resource management (62 percent), renewable energy technology (51 percent), waste management and recycling (47 percent) (see Table 1).

Table 1. Importance green skills for companies

No	Green skills	Number of companies in percent
1.	Renewable Energy Technology	51
2.	Energy Efficiency	87
3.	Sustainable Resource Management	62
4.	Circular Economy Practices	28
5.	Eco-design and Sustainable Production	34
6.	Green Building and Sustainable Construction	6
7.	Waste Management and Recycling	47
8.	Water Management	9
9.	Green Finance and Investment	19
10.	Sustainable transportation and logistics	34
11.	Sustainable Agriculture and Agroecology	2

Although 93 percent of the surveyed companies believe that employees with green skills contribute to the overall sustainability and environmental responsibility of their enterprise, even 51 percent of the participating companies

indicated that they do not have a dedicated strategy emphasizing the development of green skills among their workforce. Conversely, 36 percent of the companies reported having a well-defined strategy already in place, while 13 percent indicated that they are presently in the process of developing such a strategy (see Figure 3).

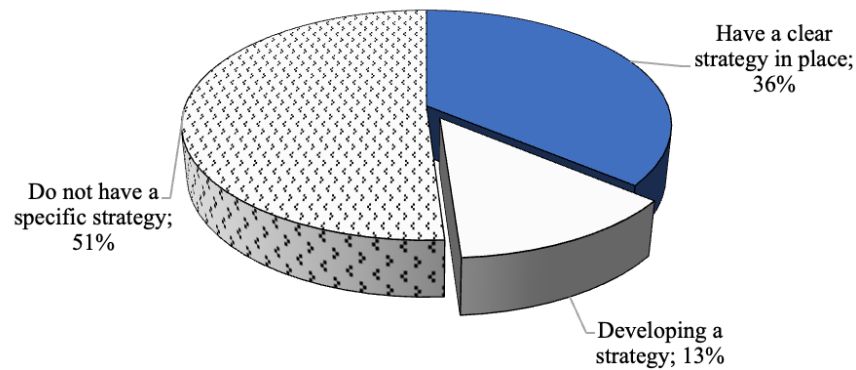


Figure 3. Enterprise strategy or policy for green skills development

The importance of green skills is also demonstrated by the training programs organized by companies for their employees in these skills. As much as 63 percent of the surveyed companies indicated that they rarely provide training for their employees aimed at improving green skills. Only 13 percent of the companies reported conducting such training systematically, 15 percent occasionally and 9 percent – never (see Figure 4).

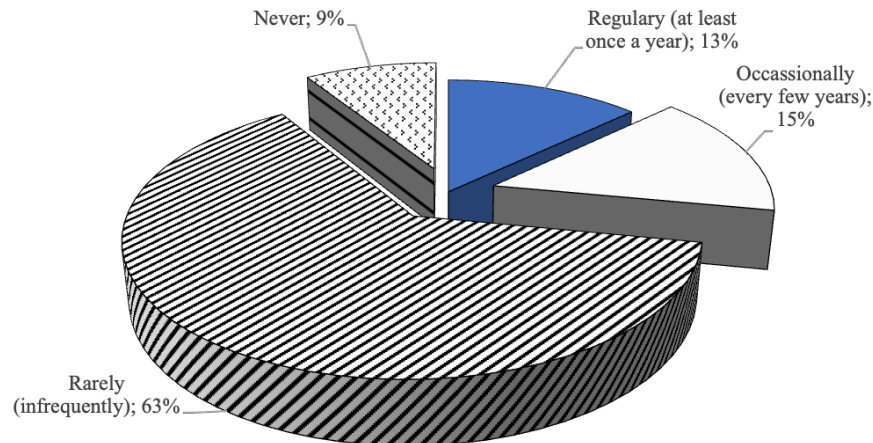


Figure 4. Evaluating the frequency of employee training for green skills

While 38 percent of surveyed companies stated that they do not encounter problems when developing their employees' green skills, other companies highlighted issues such as the lack of motivation among employees to adapt to sustainable development goals (36 percent), shortage of professionals capable of conducting such training (36 percent), a shortage of resources for employee training (31 percent), the lack of employee understanding regarding the importance of green skills hampers the company's future prospects (31 percent) (see Table 2).

Table 2. The challenges that company face when developing green skills

No	Types of challenges	Number of companies in percent
1.	The lack of employee understanding regarding the importance of green skills hampers the company's future prospects	31
2.	The lack of motivation among employees to adapt to sustainable development goals	36
3.	A shortage of resources for employee training	31
4.	Unclear forms and methods for developing green skills	29
5.	Lack of collaboration among individual departments	11
6.	Shortage of professionals capable of conducting such training	36

The surveyed companies indicated various forms of collaboration with higher education institutions in the development of green skills: collaboration in the development of new study programmes and the process of updating existing content (57 percent), organizing joint seminars for green skills development (55 percent), collaboration in the development of instructional materials on the topic of green skills development (49 percent), providing students with

internship opportunities in a company to acquaint them with the significance of green skills in specific workplaces (38 percent) (see Table 3).

**Table 3.** Collaboration with higher education institutions in developing green skills

No	Types of collaboration	Number of companies in percent
1.	Collaboration in the development of new study programmes and the process of updating existing content	57
2.	Collaboration in the development of instructional materials on the topic of green skills development	49
3.	Organizing joint seminars for green skills development	55
4.	Providing students with internship opportunities in a company to acquaint them with the significance of green skills in specific workplaces	38
5.	Collaboration in formulating topics for students' final projects and semester assignments related to the relevance of green skills	23
6.	Conducting joint scientific research on the topic of green transformation	21
7.	Contributing to the development and implementation of informal education programs related to green skills development.	21

The study aimed to enhance understanding of green skills practices in enterprises, involving 47 companies from the Panevezys region, with various sizes and business activities. It revealed that while many companies acknowledge the significance of green skills among employees, over half of them lack a specific strategy for fostering these skills, highlighting the importance of collaboration with higher education institutions to promote green skills.

## CONCLUSIONS

Even though there is no one definition of the knowledge, skills, beliefs, and attitudes required to live in, build, and support a society that lessens the effects of human activities on the environment is referred to as green skills needed by the workforce, in all sectors and at all levels recognized as having three components: knowledge (cognitive dimension), skills/abilities (psychomotor dimension), and attitudes/values (affective dimension). These components include design, leadership, management, city planning, landscaping, energy, finance, procurement, waste management, and communication.

Since there does seem to be a gap between learned abilities and market demands, what should be taught to students regarding sustainable development is still a topic that needs discussion. Additionally, there isn't enough data in the literature detailing the sustainability competencies that industry representatives require.

In response to the question of what sorts of abilities need to be further developed, businesses give a few examples: learn how to effectively take in and process new information, embrace sustainability across all subject areas, understand how sustainability issues relate to and affect businesses and be able to interact and collaborate with people of all backgrounds, tongues, and perspectives. Enhancing the incorporation of these ideas into the current HEI's curricula was a priority.

The 3LOE initiative, which stands for Three-Level Centres of Professional Excellence: Qualification, Entrepreneurship, and Innovation in the Green Economy, is essential for improving the development of green skills and promoting an ecologically conscious and sustainable society through the collaboration of industries and HEIs

The survey found that while most companies believe that employees with green skills contribute to the overall sustainability and environmental responsibility of the company, most companies do not have a strategy to develop these skills and only a small number of them provide systematic training in this area. The companies surveyed identified various forms of cooperation with higher education institutions to promote green skills. These include developing and updating new study programmes, organizing joint seminars, developing teaching materials and providing internship opportunities for students. These results underline the importance of bridging the green skills gap in enterprises through effective cooperation with higher educational institutions.

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