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Integration of Green Competencies in Entrepreneurial Practices for Sustainable Development of the Industry

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Abstract: Today, industrial enterprises face the challenges and opportunities of the green transition, sustainable development, and digital transformation. In their long-term entrepreneurial strategies, there are significant investment costs related to increasing sustainability and imposing circular practices. A significant part of them is focused on training human resources to understand environmental and sustainability issues and knowledge about the possible impacts of human activity on ecosystems. Such an effort leads to a paradigm shift in the way the industry operates and to the search for new management approaches to training people. Such training is an invariable element of the transformation of the economy toward a green and circular economy. Thus, the focus of attention is on new competencies, knowledge, skills, and experience, which are critically important for going through the transformation of the industry toward green and sustainable strategies, policies, and practices. Based on the research, a specific set of competencies has been analyzed and formulated, defined in their entirety as green competencies. The aim of the study is to derive the requirements for the competence profile of workers in industrial enterprises, with an emphasis on their environmentally and socially responsible behavior. As a result of the study and analysis, guidelines for integrating green competences into entrepreneurial practices for sustainable industry development are indicated, which can contribute to the development of the entire economy.

Keywords: Green competence, Industrial enterprise, Industry 5.0, Sustainable development, Green transformation

Introduction

Sustainable living requires a change in the way we think and behave, with an emphasis on equality and justice for current and future generations. A new paradigm has emerged for developing the economy, industry, and society that aims to enhance both the ecological and social environments. Within this paradigm, our relationship with the environment is grounded in the understanding of the inseparable connection between humanity and nature, which informs how we structure our behavior in both work and social settings. In this regard, competencies are the core for moving forward, innovating, and making transitions (OECD, 2005).

As a direct consequence, learning to acquire green competence should enable individuals to think holistically and question the model of existing economic systems. Within the 'new' economy, they need to amend it according to social, environmental, and governance (ESG) factors. To this end, we should encourage both individual and collective efforts to transform society and create a sustainable future in relation to the industry's development prospects.

The nature of jobs, the functions performed in the workplace, and the competences needed for these functions are directly affected by the intertwining of the green and circular economy concepts with the increased requirements for sustainability. In the new conditions, identifying workers' skills is a key management task. Several studies have found that there is a serious difference and discrepancy between the competencies required by employers and those actually possessed by employees. This gap occurs not only as a result of rapid technological progress but also due to the new requirements for the workforce to have relevant technical knowledge and digital competence, as well as human- and environment-oriented skills. These interrelated aspects in terms of technology, people, their employability, and sustainability issues are crucial for the long-term development of the economy, industry, and society. The imperative industrial transformation points to the value of personnel adapting to evolving organizational cultures, especially when industries involve the integration of not only new technologies but also new green competencies into entrepreneurial practices in the industrial environment.

The new industrial framework, based on new technologies and innovations in industrial enterprises, aims to ensure public welfare as well as better conditions for successful and sustainable business development. At the same time, industrial development must take into account the need to protect ecosystems and biodiversity while reducing energy and raw material consumption, as well as reducing waste and pollution. This is an ambitious goal, the achievement of which requires capacity and trained personnel (Nikolajenko–Skarbalė et al., 2021). It will also lead to the creation of green jobs to ensure safe, healthy, and satisfying working conditions while ensuring smart, sustainable, and inclusive growth of the economy and society. The integration of green competences in entrepreneurial practices is associated with innovation and increased knowledge about the green economy and specific circular skills, on the basis of which new business ideas will be created and developed and opportunities for product, process, and organizational innovations will be identified.

Background Theory and Literature Review

The concept of green competence has emerged as a multidimensional construct that integrates environmental awareness, sustainability-oriented knowledge, and behavior aligned with ecological responsibility. Its theoretical underpinnings lie at the intersection of environmental education, sustainable development, and organizational learning, emphasizing the need to equip individuals with the capabilities to navigate ecological challenges and drive sustainable transitions (Wiek et al., 2011; Rieckmann, 2012) and to cope with the digital and AI transformation (Yanev, 2024).

From a cognitive perspective, green competence entails systems thinking and anticipatory skills that enable individuals to understand complex ecological interdependencies and long-term sustainability outcomes (Redman & Wiek, 2021; Lambrechts et al., 2013). These cognitive foundations are supported by affective dimensions, such as environmental values, pro-sustainability attitudes, and ethical responsibility (Barth et al., 2007; Lozano et al., 2017). Furthermore, the behavioral dimension is central to the operationalization of green competence, involving the practical ability to initiate and manage environmentally sound practices across professional and societal domains (Mochizuki & Fadeeva, 2010).

In industrial contexts, green competence is becoming increasingly relevant as a strategic capability supporting the shift toward sustainable and circular production models. Companies operating in resource-intensive sectors, such as manufacturing, energy, and mining, face mounting regulatory and market pressures to reduce emissions, manage resource efficiency, and minimize environmental impact (Delgado-Ceballos et al., 2012; Jabbour et al., 2015). Employees with strong green competencies are better equipped to support eco-innovations and green innovations, implement environmental management systems, and foster cross-sector collaboration, particularly in industries undergoing transition to low-carbon operations (de Sousa Jabbour et al., 2020).

Moreover, green competence is closely associated with the successful deployment of circular economy practices within the industry. It facilitates the adoption of lifecycle thinking, the design of closed-loop systems, and the integration of sustainability indicators in performance metrics (Bag & Pretorius, 2020). In mining and extractive industries specifically, green competence plays a critical role in guiding environmental risk assessment, waste valorization, and the development of sustainable technologies for critical raw materials (Hoffmann et al., 2021; Veleva & Bodkin, 2018).

The development of green competence within industrial organizations often depends on institutional support, continuous learning environments, and cross-disciplinary collaboration (Leal Filho et al., 2020; Lozano, 2015). Training programs, corporate sustainability reporting, and employee engagement initiatives have proven

effective in strengthening green competence and embedding sustainability into corporate culture (Jabbour et al., 2010; Testa et al., 2016).

The academic literature emphasizes that green competence should be viewed not as a static skill set but as a dynamic, context-dependent capacity that evolves with technological advances, regulatory developments, and shifting societal expectations (Rieckmann, 2012; Balsiger et al., 2017). In this regard, green competence contributes not only to individual employability and ethical development but also to organizational resilience and systemic innovation in the face of ecological constraints.

The concept of "green competence" is relatively new and refers to the skills, knowledge, experience, and attitudes actually applied in a practical working environment and necessary to successfully address the challenges of sustainable and environmentally friendly business development. This competence becomes important for professionals, organizations, and society as a whole, as it helps to achieve a balance between economic development, social justice, and environmental protection. Key green skills and knowledge integrated into green competencies available and published as a result of research on the topic are summarized below.

- *Eco-awareness and eco-education*, including:
- Understanding of environmental and sustainability issues and the issues they raise and need to be addressed;
- Knowledge of the possible impacts of human activity on the environment and their consequences.

- *Eco-innovations and technologies*, including:
- Skills to develop innovative technologies that improve energy efficiency and reduce adverse environmental impacts;
- Skills to apply innovative technologies that improve energy efficiency and reduce adverse environmental impacts;

- *Sustainable resource management*, including:
- Ability to manage resources efficiently with emphasis on knowledge of specific recycling practices, use of renewable energy sources, and sustainable use of natural resources.
- Ability to look for opportunities to increase the sustainability of processes, systems, and operations;

- *Social economy*, including:
- Understanding the interaction between economics and social justice in the context of sustainability;
- Skills to develop business models that are socially responsible and environmentally friendly.

- *Collaboration and communication*, including:
- Ability to work in a team and communicate effectively with stakeholders to achieve common environmental objectives;
- Possession of soft skills and competencies.

- *Ethics and responsibility*, including:
- Understanding the ethical implications of the activity and being accountable to society and the environment.

- *Civic engagement and participation*, including:
- Engaging in community and social initiatives that promote sustainability;
- Civic awareness.

The approach to green skills and knowledge is presented in the framework of the European Skills Agenda (2020). At the same time, one of the main tasks is to determine a taxonomy of skills for the green transition, which will allow statistical monitoring of the greening of professions. The decision is set out in the European Sustainability Competence Framework—GreenComp, introduced in 2022. GreenComp responds to the growing need for people to improve and develop the knowledge, skills, and attitudes to live, work, and act in a sustainable manner (Bianchi et al., 2022). GreenComp is a main reference framework for sustainability competences, which are needed to be presented in the new context—Industry 5.0, green and circular economy, and deep transformation. GreenComp defines sustainability as a competence that is relevant for all ages and forms of learning—formal, non-formal, and informal. This competence develops knowledge, skills, and attitudes about sustainability to take action for the benefit of ecosystems and justice. The development of this competence begins at an early age and continues throughout life.

One of the key priorities of the EC in the field of education and training for the period 2019-2024 is mainly sustainability. In 2019, the EC adopted the European Green Deal, a European Skills Agenda for Sustainable Competitiveness, Social Fairness, and Resilience. It brought attention to the need to develop a pan-European framework for competences in the field of sustainability. A subsequent strategy, the Biodiversity Strategy to 2030, also highlights the significant role of education and training in making Europe a climate-neutral continent by 2050.

The European Commission is introducing measures to achieve sustainable development through education and training. An important aspect is the acquisition of competences in the field of sustainability, which promotes responsible behavior and action at all levels. GreenComp has been developed as a European framework for competences in sustainability, which provides guidance for educational institutions to adapt their practices in line with the requirements of environmental sustainability. Goal 4 "Quality education" is also established in this context as part of the 17 UN Sustainable Development Goals. GreenComp consists of 12 competencies organized in the following four areas (Bianchi et al., 2022), referred to as embodying sustainability values, comprehending the many variables involved with the concept of sustainability, forecasting a sustainable future, and taking steps to promote sustainability. The twelve competencies, organized into the four areas, are presented below (Bianchi et al., 2022):

- *Embodying sustainability values*, including the following competences:
- valuing sustainability;
- supporting fairness;
- promoting nature;

- *Embracing complexity in sustainability*, including the following competencies:
- systems thinking;
- critical thinking;
- problem framing.

- *Envisioning sustainable futures*, including the following competencies:
- futures literacy;
- adaptability;
- exploratory thinking.

- *Acting for sustainability*, including the following competencies:
- political agency;
- collective action;
- individual initiative.

As a consequence, at the beginning of the century, several European countries began to reform their education systems, moving from a knowledge-based approach to a competence-based one. This process led to the formulation of specific competencies for sustainability, especially in higher education, with the aim of making students and professionals agents of change (Mukerji and Tripathi, 2013). Despite broad agreement on the necessary competencies, their adoption in different programs depends on local institutions at the national level, which in practice approve and guide these programs. The next step is to continue this process within enterprises, as the greening of the industry cannot occur without developing such capacity.

In fact, sustainability education encompasses different aspects of life and the interrelationships between them—environmental, social, cultural, and economic. The acquired competences help learners to understand and manage the complexity of the systems in which we live and to plan and act in their work and social life with an eye to environmental sustainability. This type of education has the potential to be a catalyst for positive change at both the individual and collective levels.As knowledge is a resource that generates added value, it follows that mastering green competencies would increase the added value of acquired higher education (through added utility) in line with the three priorities of the Europe 2020 strategic framework, namely: (1) smart growth—building an economy based on knowledge and innovation; (2) sustainable growth—fostering a greener and more competitive and more resource-efficient economy; and (3) inclusive growth—fostering an economy with high employment levels that creates the conditions for social and territorial cohesion (Bianchi et al., 2022). These competences, integrated into green competences, are becoming increasingly important in light of the growing concern for environmental protection and the need for sustainable development to go hand in hand with progressive business development and environmental protection. In the context of scientific development and its

scope, green competence is a central focus in the study of the relationship between entrepreneurship and sustainability in the industry, and the study is made on the example of the mineral industry.

Green competencies are now mandatory for developing entrepreneurial initiatives in an industrial environment and implementing innovations. In combination with entrepreneurial competence (Bacigalupo, 2019; Bacigalupo, 2016), they provide a basis for business development and competitiveness through which to achieve relevance of requirements, challenges, and opportunities. On the one hand, without the presence of these competencies, it is difficult to initiate entrepreneurial initiatives and to create and utilize opportunities. On the other hand, they are also necessary for subsequent developments and responses to the growing environmental and social requirements of the industry.

Methodology

The methodology of research development encompasses several established scientific methods, including literature review, analysis, synthesis, induction, deduction, comparison, analogy, questionnaire administration, summarization, systemic approaches, heuristic methods, and graphical techniques. The methodology is aimed at identifying green competences in the industrial sector (on the example of the raw materials industry) so as to identify specific competences and skills that are key to achieving sustainability in an industrial environment. Also, we explore the opportunities and challenges of accumulating such competencies within the framework of entrepreneurial practices in the industry, using the raw materials sector as an example.

For the purposes of the study and the construction of its methodology, the requirements of the main documents regarding green competence are analyzed, namely: European Skills Agenda for Sustainable Competitiveness, Social Justice, and Resilience; GreenComp; European Strategy for Universities; Council Recommendation on Learning for the Green Transition and Sustainable Development; and a European Competence Framework for Sustainability. The criteria for sustainability of economic activities are described and systematized, taking them into account when planning the survey and its focus.

Based on the critical review of these documents, it has been found that there is a growing awareness and desire among young people to engage with sustainable development issues, in particular environmental and climate issues, and to be entrepreneurial in this area. The results of a Eurobarometer survey published in May 2022 show that young people in the EU consider “protecting the environment and combating climate change” to be one of the key priorities on which the European Year of Youth (2022) should focus. Data from the Organization for Economic Cooperation and Development (OECD) from 2018 show high awareness among 15-year-olds about climate change, the environmental crisis, and the need to address them. Therefore, it is necessary to explore both the prerequisites and the models, methods, and approaches for the formation of green competence. This work enables us to examine the educational and training opportunities that equip specialists with the necessary green competencies for the ecological transition and sustainable development in industry.

The relevance of the study is proven and justified, given the fact that the topic is widely discussed at the national, European, and international levels. The reason for the serious scientific and public interest is the significance of the research problem of competencies and their role in the professional realization and career development of specialists, as well as in the transition from education to employment. This interest and significance are further increasing in the context of new trends and prospects for socio-economic development—Industry 5.0, green transition, digitalization, digitization, and innovative business development based on open and decentralized approaches to innovation, training, and human resources development.

The scope of the study extends beyond a single organization and sector, even though the survey specifically targets the raw materials industry. The focus of the study is placed on the raw materials industry, since green competence is absolutely necessary for working in this industry nowadays. However, a significant part of the conclusions may be valid and relevant for other industries, given the general context and starting point of the study. So the research focuses on the essential green competencies required for human resources in the raw materials industry, as well as the need to develop these competencies in both educational and work environments to foster entrepreneurial initiatives and implement innovations.

The limitations of the study stem from the low participation of business representatives in surveys and the challenges associated with accessing them. The study is based on the fact that Industry 5.0, the green transition, digitalization, and innovative business development require a change in the thinking, attitude, and concept of

business regarding the workforce and its competencies. This change implies an assessment of the green competencies of human resources and the need for their development in the educational and work environments.

The results of the study become the basis for drawing conclusions—guidelines for practice. The sought contribution is of a theoretical and applied nature. The hypothesis that should be proven or rejected is that the integration of green competencies in entrepreneurial practices in industry provides conditions for greater sustainability and environmental protection and leads to sustainable development and competitiveness, allowing for the creation of more innovations and being relevant to the context. To verify the hypothesis, the search for opinions based on surveys and the determination of employers' attitudes are the main tasks of the study, through which to fulfill the goal and verify the hypothesis.

Analysis and Results

A Questionnaire Survey

Within a few months in 2024, a survey was conducted on the opinion of employers in the raw materials industry on what they think are the necessary competencies of human resources engaged in future employment in their companies. The study involved 11 large companies from the raw materials industry. Their distribution is as follows: 71% of them have more than 250 employees, and the rest also have more than 50.

The first question primarily focuses on employers' understanding of the competencies that make up the concept of green competency. The results are "Yes, I am completely familiar"—42.9%, "I have heard"—42.9%, and "For the first time I hear"—14.3%. Figure 1 represents them. A favorable impression is made by a proficient knowledge of the content of green competence, although it is a relatively new type of competence. It should be borne in mind that the companies surveyed are from a sector characterized by high risks to the environment and sustainability, and it can be reasonably assumed that this specificity contributes to greater familiarity with green practices and skills. Those working in the raw materials industry are distinguished from those employed in other industries by a satisfactory level of knowledge about the possible impacts of human activity on the environment. Recognition by employers that such competence exists is essential for subsequent opportunities for it to accumulate as human capacity.

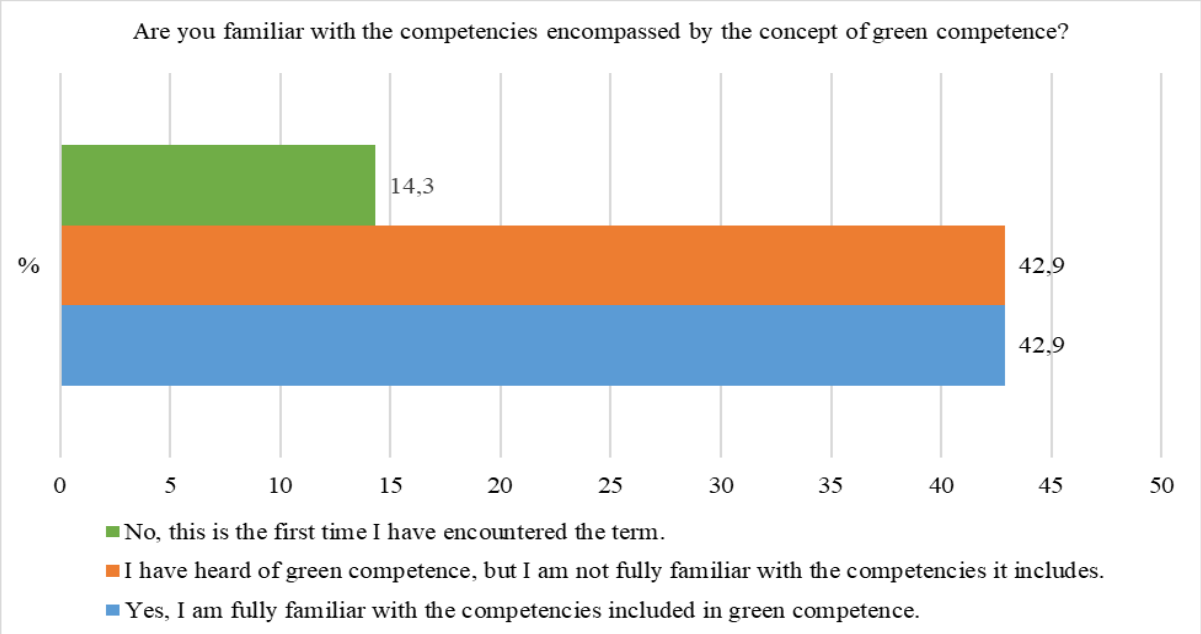

Figure 1. Employers' knowledge of the competencies included in green competence
Source: Survey conducted by the author among business representatives in 2024

The next group of questions concerns employers' expectations about the importance of skills related to green competence for finding employment. Managers in the raw materials enterprises clearly state that skills related to green competence are important for finding employment. "To a large extent"—14.3%, "Yes"—57.1%, "Rather yes than no"—14.3%, "No"—14.3%.

It is already justified to a large extent to hold on to green skills, which will become more and more relevant and necessary because of the EU standards for reporting corporate sustainability. According to the 2025 Corporate Sustainability Reporting Directive, large enterprises will have to report KPIs for all six environmental objectives, which are based on the 2024 directive: turnover, CAPEX, and OPEX starting from 2026. KPIs—key performance indicators—are metrics that are quantifiable. Each business defines its own individual set of KPIs and then tracks the achievement of specific goals through regular measurements. Capital expenditure (CAPEX) is finance used by a company to acquire or improve physical assets such as real estate, industrial buildings, or facilities. Operating expenditure (operating expense, operational expense, operational expenditure, or OPEX) is the current expense required to maintain a product, business, or system.

The next group of questions provides employers with insights into whether their current and future employees possess, or should possess, competencies related to green skills and to what extent. In the analysis of the survey, they combined the questions about the green competencies possessed by the employees, including their problem-solving skills and engineering thinking. It is clear from the answers that workers must not only understand the problems but also have the ability to offer a solution in an unconventional way to develop and apply new technologies. The result gives reason to assume that employers are inclined to develop their own and engage in various educational initiatives aimed at acquiring specific green skills.

Employers in the raw materials industry rely on and hire mainly personnel who have graduated from Bulgarian universities. Universities nowadays aim to train engineers to solve various problems and develop critical thinking and creativity skills. Managers believe that employees largely possess perseverance and consistency, which are essential for achieving satisfactory results.

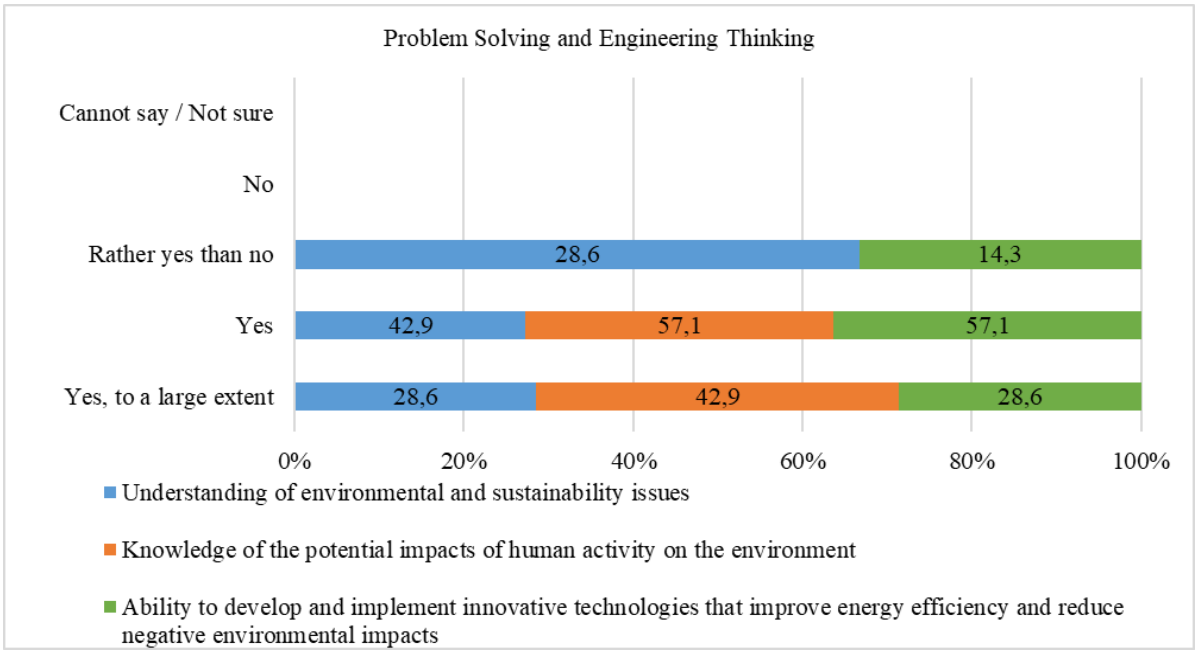

Figure 2. Green competence possessed by employees in the part that includes their problem-solving skills and engineering thinking

Source: Survey conducted by the author among business representatives in 2024

All companies, not only those in the raw materials industry, face the challenges of green transition and sustainable development. They must adequately respond to increasing demands from state and EU policies and be relevant to society's expectations. They include in their long-term corporate strategies increased costs for sustainability-related investments, including significant investments in training in new skills. Part of this investment is aimed at training human resources in the direction of understanding environmental and sustainability issues and knowledge about the possible impacts of human activity on the environment. These trainings are expected to accumulate valuable competencies and achieve greater sustainability, efficiency, and competitiveness. Employers expect their employees to have the skills to develop and implement innovative technologies that improve energy efficiency and reduce adverse environmental impacts (around 60% positive responses). Enterprises in the raw materials industry have requirements for the training of their future personnel to be aimed at environmental protection, with an emphasis on environmentally and socially responsible behavior. This is an expected and adequate approach in the context of digitization and greening processes.

The following are the questions that concern the importance of the motivation and conviction of employees and future employees for employers. Those who completed the survey assessed the green competence possessed by the employees in their part, including their skills for independence, initiative, and social responsibility. Is it important to be able to take risks and manage a business to make environmentally friendly decisions leading to the sustainability of business and the economy as a whole? In relation to green competence, the questions were related to possession of the following skills (Figure 3):

- The ability to manage resources efficiently, which emphasizes recycling, renewable energy sources, and the sustainable use of natural resources, received a predominant score of "To a large extent" at 57.1%, followed by "Yes" at 28.6%, and "Rather yes than no" at 14.3%;
- The understanding of the interaction between economics and social justice in the context of sustainability is demonstrated by a predominant "Yes" score of 57.1%. With the same result are "To a large extent" and "Rather yes than no"—14.3%; answers "No" and "I can't decide" are not registered.

All companies, not only those in the raw materials industry, face the challenges of green transition and sustainable development. They include in their long-term corporate strategies increased costs for sustainability-related investments, including significant investments in training in new skills. Part of this investment is aimed at training human resources in the direction of understanding environmental and sustainability issues and knowledge about the possible impacts of human activity on the environment. These trainings are expected to accumulate valuable competencies and achieve greater sustainability, efficiency, and competitiveness. Employers expect their employees to have the skills to develop and implement innovative technologies that improve energy efficiency and reduce adverse environmental impacts (around 60% positive responses). Enterprises in the raw materials industry have requirements for their future personnel's training to be aimed at environmental protection, with an emphasis on environmentally and socially responsible behavior. This is an expected and adequate approach in the context of digitization and greening processes.

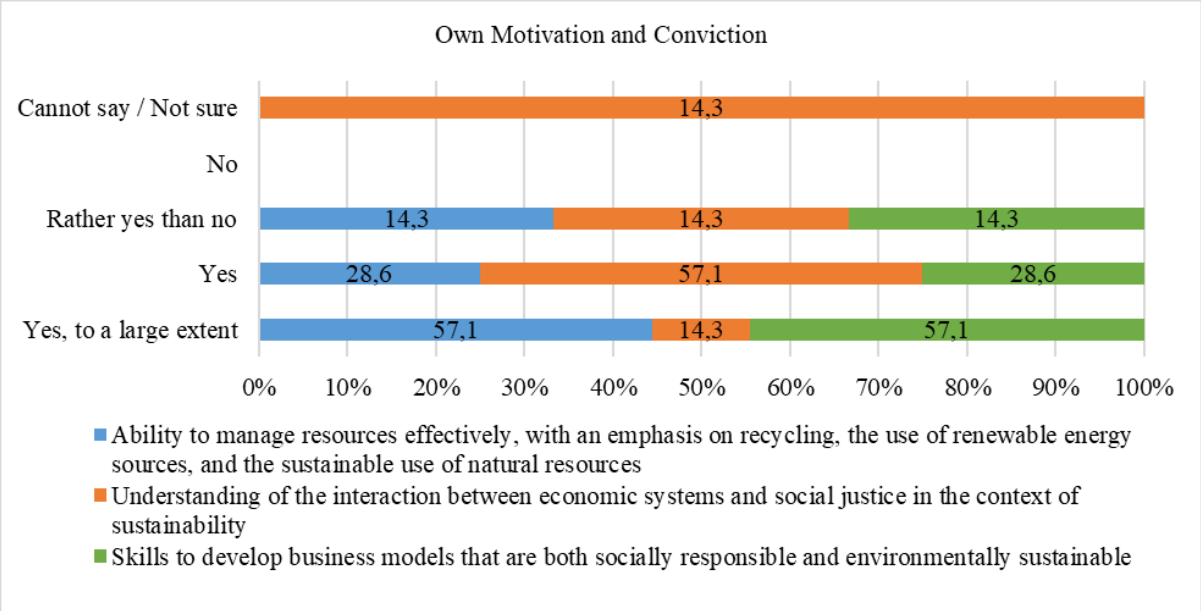

Figure 3. Green competence possessed by employees in the part that includes their self-motivation skills
Source: Survey conducted by the author among business representatives in 2024

In relation to green competence, the questions were related to possession of the following skills (Figure 3):

- Ability to manage resources efficiently, emphasizing recycling, renewable energy sources, and sustainable use of natural resources—with a predominant score of "To a large extent"—57.1%, in second place, "Yes"—28.6%, and "Rather yes than no"—14.3%;
- The understanding of the interaction between economics and social justice in the context of sustainability received a predominant "Yes" score of 57.1%. The scores for "To a large extent" and "Rather yes than no" are both 14.3%;
- Skills for developing business models that are socially responsible and environmentally friendly—with a predominant score of "To a large extent"—57.1%, in second place "Yes"—28.6%, and "Sooner yes than no"—14.3%.

The high score of positive responses (about 85%) to the importance that employers attach to the socially responsible and environmentally friendly skills of their employees is justified in relation to the challenges of the transition to a circular economy. It is up to enterprises' human resources to apply the principles of social justice and use natural resources sustainably. The inner conviction of employees is fundamental in the development and implementation of sustainable business models in the industry. It is important to be able to take risks and manage a business to make environmentally friendly decisions leading to the sustainability of business and the economy as a whole.

Workers' social skills and teamwork are included in green competence, which encompasses teamwork skills and effective communication (Figure 4). Additionally, respondents recognized the significance of teamwork within a specific organization that collaborates with non-governmental communities to address environmental issues as an essential skill. For employers, communication skills and employee engagement with the environment and society are also important. The most important thing for the employees is the ability to work in a team and communicate effectively with stakeholders to achieve shared environmental objectives.

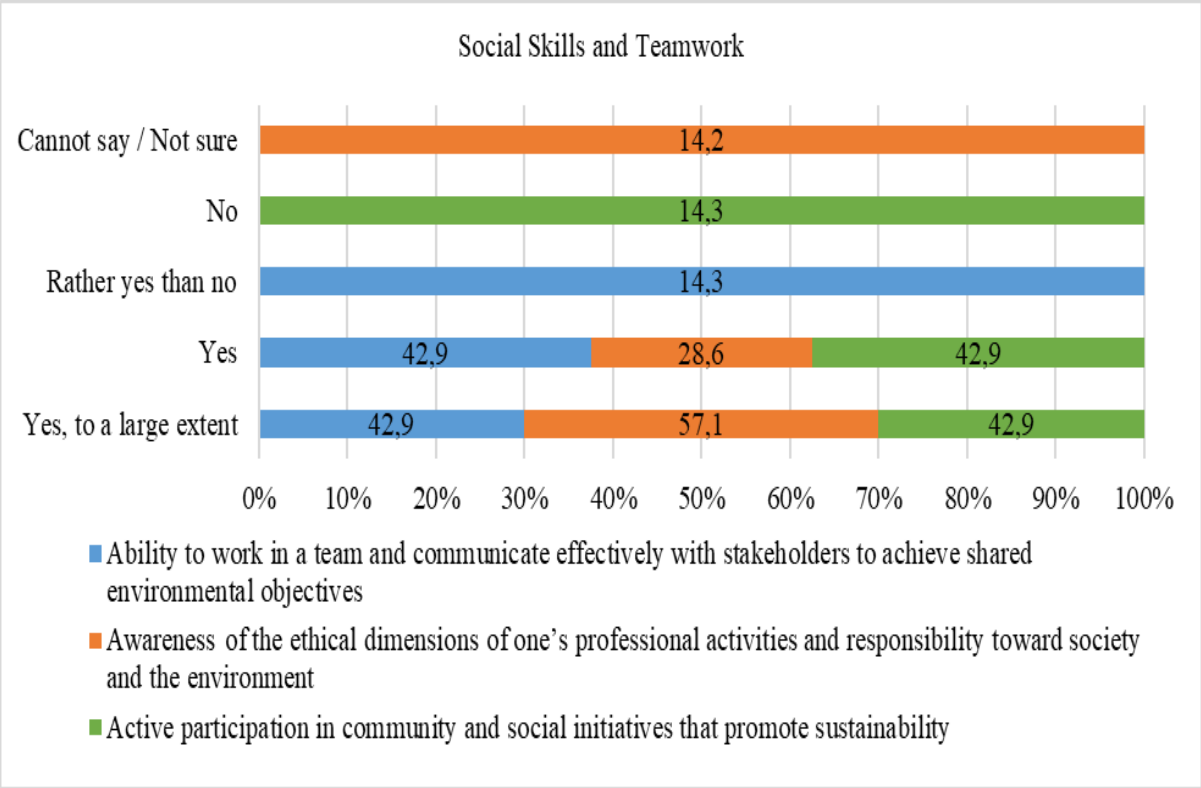

Figure 4. Green competence possessed by employees in the part that includes their teamwork skills
Source: Survey conducted by the author among business representatives in 2024

The positive answers are indicative, because today, companies in the raw materials industry are committed to the ethical aspects of their activities and to responsibility towards society and the environment. They are largely engaged in community and social initiatives that promote sustainability. There are enough beneficial practices in these areas that can be cited as examples. All this requires their employees to have teamwork skills and effective communication with stakeholders to achieve common environmental goals. Building favorable social relations supports the achievement of company strategies.

Findings and Discussion

Based on thorough research and observation of the practice, we can identify some relationships and connections between the main players involved in building competence. We can make several recommendations for individual agents to plan their activities and accelerate the accumulation of green competencies.

Recommendations to the State Administration:

- Creation of regulations for enterprises on compliance with ethical and social aspects of their activities, by adapting collective bargaining to green dialogue of sectoral and cross-sectoral social partners to support the most vulnerable participants;
- Creating a new strategic action framework to prepare employers, training institutions, and the workforce to implement strategies related to the Green Deal;
- Supporting enterprises with their involvement in projects for building green infrastructure and implementing sustainable technologies and practices in their production processes.

Recommendations to the Universities:

- Including eco-awareness, eco-education, and sustainable resource management in the curricula for training students in relevant disciplines;
- Rethinking the traditional teaching model, with the inclusion of practicums in a real working environment for the acquisition of green competencies and the education of responsible behavior;
- Offering a wide range of thematic courses for workforce retraining, which are jointly developed with business representatives to support the implementation of the green transition;
- Participation in joint projects with enterprises on the occasion of the implementation of innovative technologies and environmentally friendly mechanisms for process management.

Recommendations to the Enterprises and the Industry as a Whole:

- Creation and use of a green entrepreneurial model, which contains requirements for sustainable and environmentally friendly behavior of workers;
- Organization of training programs and workshops on the acquisition of green competencies by human resources;
- A code of ethics governing employee relations and management-employee relations;
- Use of green and recyclable technologies in the production process;
- Actively working with all stakeholders in relation to the green transition and achieving social justice, well-being, and sustainability.

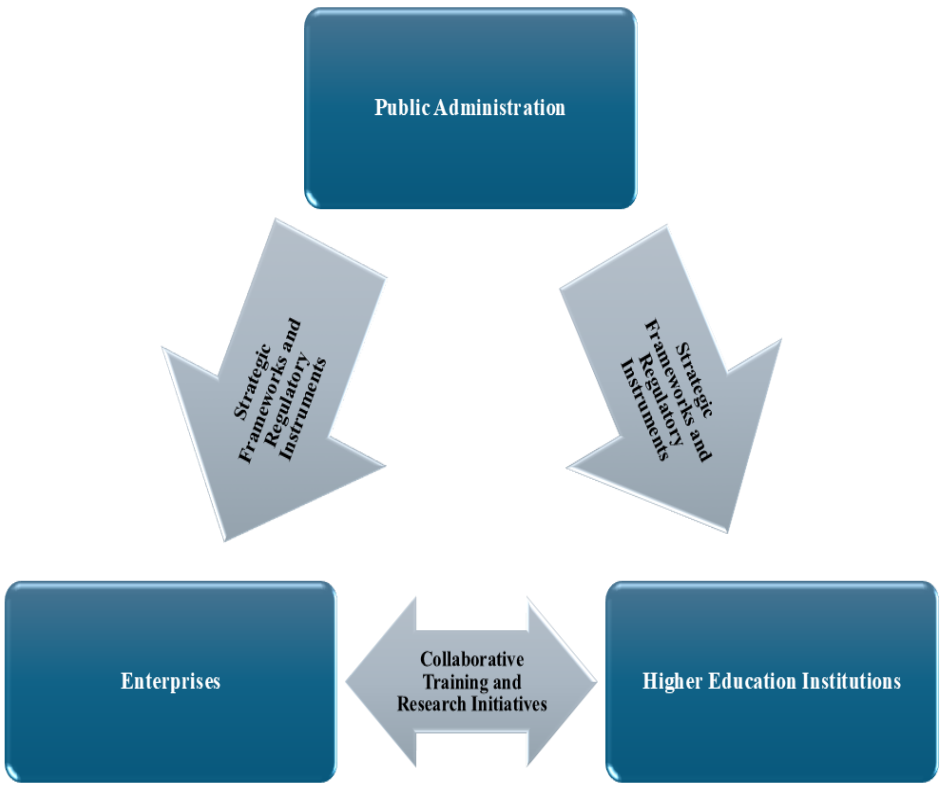

Figure 5. Link business, higher education, and the state to create capacity for the development of green competencies.
Source: Author's research and summaries, 2025

The connections and interdependencies between different agents guarantee that competencies can be accumulated through different methods and approaches—formally and informally, and at different levels (Figure 5). This allows them to be built upon and developed in accordance with the direction and priorities of the economy and society. All specific measures and recommendations should be implemented jointly and in a synchronized manner. Therefore, a specific policy and strategy is needed at both the micro and macro levels to achieve common strategic goals.

Conclusion

Through the analysis of entrepreneurial practices in the raw materials industry and the identification of green competencies in the industrial sector, the opportunities for their implementation in entrepreneurial practices are assessed. The opportunities and challenges that the implementation of the studied green competencies provides for entrepreneurial development in the raw materials industry are also examined.

It stresses that employers in the raw materials industry rely on the possession of green competence and on the role of the universities for acquiring it. Engineering training at the Bulgarian universities is aimed at obtaining knowledge for solving problems of a different nature and acquiring skills for critical thinking and creativity. Employers expect their employees to have the ability to solve problems, including in an unconventional (innovative) way, as well as the perseverance to achieve the desired result. They believe that having an understanding of environmental and sustainability issues and knowledge of the possible impacts of human activity on the environment is of essential importance in the context of greening the industry and the economy and increasing social responsibilities. They even rely to a large extent on skills for developing and implementing innovative technologies that improve energy efficiency and reduce adverse impacts on the environment. Possessing these skills is a prerequisite for the professional success of specialists in the context of digitalization, artificial intelligence, and the green transition.

Recommendations that can be given to companies in the industry are as follows:

- The industrial companies should integrate green competencies into their entrepreneurial practices by promoting sustainable and environmentally friendly behavior among employees and trainees, emphasizing recycling, the use of renewable energy sources, and the sustainable use of natural resources.
- The industrial companies should organize periodic training of their staff to acquire new skills necessary for today's industrial, digitalized, and "greened" economy, including workshops, educational initiatives, problem-solving tasks, etc.;
- The industrial companies aim to enhance the dedication and unexplored capabilities of their employees while also fostering the establishment of a desired organizational culture. It is necessary to build platforms to promote social communication between employees, as well as the possibility of public awareness.

These practices and initiatives should not be isolated from the practices and initiatives of other key agents and stakeholders. It is in the symbiosis between business, higher education, and the state, in combination with the non-governmental sector, that synergy should be sought in the acquisition of competencies and the development of human capital.

Recommendations

Future research should focus on developing various tools, including digital ones, and methods for accumulating green competence and testing their applicability in real practice. Tools and methods should be developed to assess the level of mastery of the relevant competence and, accordingly, whether there is a discrepancy between the actual state and the desired one and what the difference is.

Scientific Ethics Declaration

* The authors declare that the scientific, ethical and legal responsibility of this article published in EPESS Journal belongs to the authors.

Conflict of Interest

* The authors declare that they have no conflicts of interest.

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