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The Importance and Challenges of Sustainable Development for the Raw Materials Sector: The Views of Key Stakeholders in Three ESEE Countries †

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† This article is an extension of the paper "The Significance of SDGs for the Raw Materials Sector: A Stakeholders' Approach in Three ESEE Countries" (https://doi.org/10.3390/materproc2021005048) presented at the RawMat 2021 International Conference on Raw Materials and Circular Economy, Athens, Greece, 5–9 September 2021.

Abstract: The raw materials (RM) sector is linked to the Sustainable Development Goals (SDGs), and it impacts their implementation, in a positive or adverse manner, throughout the whole RM value chain (e.g., mining, processing, metallurgy, recycling, etc.). This study aims to identify and rank the SDGs that are classified as more significant for this sector, according to the views of key stakeholders, university students, academics, professionals, and industry representatives, in three East and South-East Europe (ESEE) countries: Greece, Poland, and Slovakia. Moreover, the expected challenges of the RM sector in the next ten years are presented and are based on the opinions of the industry representatives of the abovementioned countries. Within this framework, 423 participants provided their views in a survey with structured questionnaires. The results were analysed on the basis of the stakeholder groups and the countries that were examined. SDG 9 (Industry, Innovation, and Infrastructure), 8 (Decent Work and Economic Growth), and 7 (Affordable and Clean Energy), were highly ranked by the stakeholders, which indicates a strong link between these SDGs and the RM sector. Digital transformation, recycling and material chain optimization for end-of-life products, and increased resource efficiency in mineral and metallurgical processes, were reported as the most important challenges that are expected to be faced by the RM industry in the next decade.

Keywords: stakeholders; sustainable development goals; raw materials sector; questionnaire survey; raw materials sector challenges

Citation: Tomazinakis, S.; Valakas, G.; Gaki, A.; Damigos, D.; Adam, K. The Importance and Challenges of Sustainable Development for the Raw Materials Sector: The Views of Key Stakeholders in Three ESEE Countries. *Sustainability* **2022**, *14*, 3933. https://doi.org/10.3390/su14073933

Academic Editors: George Banias, Konstantinos N. Kontogiannopoulos and Evangelos Tzamos

Received: 13 February 2022
Accepted: 22 March 2022
Published: 26 March 2022

1. Introduction

Raw materials (RM) are vital to the well-being and prosperity of societies on a large scale. As is reported by Mancini and Sala [1], minerals, metals, and their industries contribute to economic development, create opportunities for decent employment, add value along the supply chains of material commodities, and improve the quality of life of local communities through the construction of new infrastructure for transport, communications, water, and energy. On the other hand, adverse impacts of the RM sector may also exist (e.g., environmental degradation, social inequality, etc.), particularly when inadequate environmental protection and social cohesion policies and measures are implemented [1]. In recent decades, the RM industry has made significant advances in the prevention, mitigation, and management of its potential impacts and risks. However, the sector is at a crossroads and is in need of a new vision, given that a measurable percentage of the general public is still of the opinion that RM companies do not make the required efforts to behave responsibly towards society [2]. Reduced social acceptance can be a significant drawback for the RM sector, which is translated into considerable business costs [3], and a lack of business opportunity.

Along these lines, the RM sector can play a critical role in the achievement of the Sustainable Development Goals (SDGs) of the United Nations' 2030 Agenda for Sustainable Development [4], as is recognized by the European Union (EU) Member States [5,6], by the Strategic Agenda 2018–22 of EIT RawMaterials [7], and by relevant studies [1,8,9]. Mancini et al. [8], for example, studied the contribution of the RM value chain to the achievement of the SDGs while taking into account the indicators that have been set for each goal by the United Nations and Eurostat. The European Bank for Reconstruction and Development (EBRD) presented its own analysis with regard to the impact of the RM sector on the SDGs [10], on the basis of data that were collected from, "Mapping Mining to the SDGs: An Atlas" [9]. The analysis of the EBRD classified the impacts of the RM sector on the SDGs with regard to its directness as "very direct", "moderately direct", and "indirect", and also depending on their enhancement (positive impact) or mitigation (adverse impact) effects. According to the EBRD, the RM sector has a very direct impact on the following SDGs: 6 (Clean Water and Sanitation); 7 (Affordable and Clean Energy); 8 (Decent Work and Economic Growth); 9 (Industry, Innovation and Infrastructure); 13 (Climate Action); and 15 (Life On Land) [10].

The achievement of the SDGs, however, requires transformational solutions that go beyond incremental innovation, and the RM sector, similar to any other sector, needs to adopt new mindsets, build new business models, and develop new technologies. The achievement of the SDGs is influenced by national realities, capacities, and levels of development, as well as by specific national challenges [11]. As is recognized by the 2030 Agenda, and as is stated in the relevant literature [12,13], the successful implementation of the SD principles depends on, among other things, inclusive participation and stakeholder engagement [14]. Along this line, the key raw materials stakeholders at the national level, and their perceptions, play an essential role in designing the strategy and policy frameworks for the achievement of the SDGs.

Higher education institutions (HEIs) with engineering programs, and especially those related to the RM sector, play a particular role in the emphasis of SD practices, in the enhancement of SD engineering processes and innovation, in surpassing the digital and broader technological and knowledge divides, and in the development of strategies to strengthen the capacity in engineering education for sustainable development (EESD). A collaboration between HEIs and the industry is expected to bridge the gap between technology, education for SD, and pedagogy, as well as to assist in the development of new tools in educational programmes [15,16]. Thus, representatives from HEIs and the industry are recognized as critical stakeholders for the application of the SD principles in the RM sector. The same applies for students who, as future professional engineers, will be required to develop innovative solutions, and to face grand emerging challenges, such as climate change and resource scarcity, while balancing economic competitiveness, environmental protection, and social acceptance [17–19]. In particular, students are motivated to engage in sustainable practices during and after university and, hence, to influence the achievement of the SDGs [20]. The academic staff also plays a crucial role in the diffusion of the SD principles, as several studies argue that the cooperation between students and the academic staff can enhance engagement, motivation, and performance [21–23]. Moreover, the faculty's knowledge and the students' awareness of the SDGs affects the pedagogical techniques that are used. The cooperation with professionals and with the industry constitutes an essential organizational issue for universities to consider when integrating SD within engineering education [24]. The industry is the main critical stakeholder in the application of the SD principles, while engineering students consider the industrial experience to be highly valuable [19].

Taking into account the role of the abovementioned stakeholders of the raw materials sector towards the achievement of the SDGs, this study aims to identify and rank the most significant SDGs for the RM sector, according to the views of 423 students, members of academic staff, professional engineers, and representatives from the industry, from three East and South-East Europe (ESEE) countries: Greece, Poland, and Slovakia. The

representatives of the industry were further requested to provide their views on the relevant importance of a number of thematic areas (i.e., the challenges that the RM industry will face in the next ten years).

On the basis of the survey data, which were collected using an online questionnaire, a comparative analysis of the ranking results within the stakeholder groups and the three ESEE countries is presented, as well as the relevant significance of the challenges that the sector is expected to face in the coming decade.

2. Materials and Methods

2.1. Research Design

This study analyses survey data, which were collected as part of the EIT RawMaterials project, "EnAct-SDGs—Enhancing the skills of ESEE RM students towards the achievement of SDGs", which was a two-year (2020–2021) EIT Regional Innovation Scheme (RIS). A schematic flow diagram of the study design is presented in Figure 1.

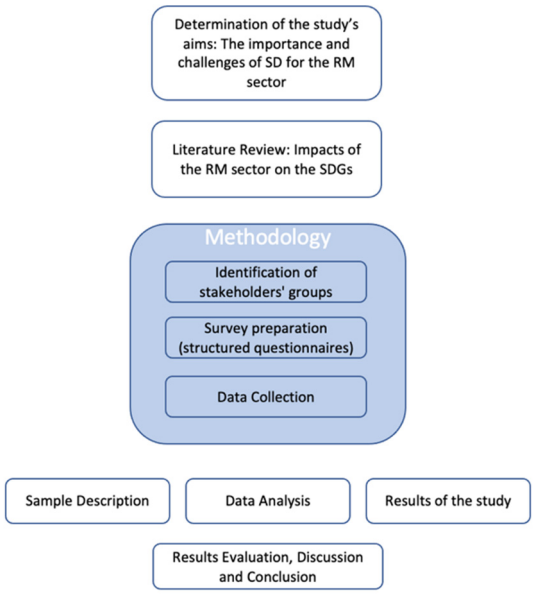

Figure 1. Flowchart for the design of this study.

2.1.1. Study Aims: The Identification of Stakeholder Groups

One of the goals of the EnAct project was the identification of the educational needs and challenges that are currently faced by the RM sector in three ESEE countries: Greece, Poland, and Slovakia. This was attained by using surveys, interviews, and communications through the EnAct-SDGs network, with the research being focused on the raw materials schools of three HEIs: The School of Mining and Metallurgical Engineering (SMME) of the National Technical University of Athens (NTUA) in Greece; the Faculty of Mining and Geoengineering (FMG) of the AGH University of Science and Technology in Poland; and the Faculty of Mining, Ecology, Process Control and Geotechnologies (FMEPCG) of the public Technical University of Kosice (TUKE) in Slovakia.

The survey's objective was to identify the educational needs and the appropriate practices in order to strengthen the development and the adoption of education for SD, policies, and strategies in the curricula of the examined universities.

2.1.2. Survey Preparation: Structured Questionnaires

The research design was based on the priority action areas that were established by the Global Action Programme on Education for Sustainable Development (ESD) [25]. These areas are: (a) Advancing policy; (b) Integrating sustainability practices into education and training environments (whole-institution approaches); (c) Increasing the capacity of

educators and trainers; (d) Empowering and mobilizing youth; and (e) Encouraging local communities and municipal authorities to develop community-based ESD programmes [25]. The research questions were framed by the opinions, and perceptions on SD of the research target groups, the role of the stakeholder partnerships, the benefits of internships, and the assessment of the curriculum structure and content according to the SD principles. Four different questionnaires were prepared in English that were addressed to the respective key stakeholder groups (i.e., students, academic staff, graduates (professionals), and representatives of the industry), and these were translated into Greek, Polish, and Slovak. The questionnaires consisted of closed-ended questions (multiple-choice, one-choice, a rating scale, and a Likert scale), while the participants were encouraged to provide supporting information, where applicable.

The students' questionnaire included 55 questions and subquestions that aimed to investigate the factors that contribute to the motivation of students in EESD, and to explore the students' opinions about the current pedagogical practices at their university (e.g., content concerning the SD principles). Moreover, their internship experience was evaluated. Specifically, the first section of the questionnaires explored the students' opinions and beliefs about the SDGs (e.g., the identification of the five most important SDGs for the RM sector; familiarity with the SDGs; a willingness to learn more about the SDGs; the role of the SDGs in overcoming conflicts between the RM industry and local communities; the practical relevance of the SDGs in RM-sector topics; the role of SD engineering practices in the act of becoming a more socially responsible engineer, etc.). The second section aimed to evaluate the existing study programme, and it included questions about the contribution of the curriculum to the students' theoretical and technical knowledge, social skills, etc., and on the integration of SD into the curriculum and their satisfaction about the level of knowledge provided. Moreover, the students were asked to indicate their level of agreement or disagreement with a series of statements (e.g.,: "SD principles should be emphasised into the current curriculum of the school"; "SD principles should be actively incorporated and promoted through all courses of my studies"; "Through my studies, I acquired an interdisciplinary understanding of sustainability", etc.), and whether they had published a paper on SD in peer-reviewed journals or conference proceedings. The third section was dedicated to internships. Students were asked whether they had an internship during their studies and whether they had completed their internship. They were also asked to point out their level of agreement or disagreement with a series of statements (e.g.,: "I learned more about sustainable development"; "I had the opportunity to implement my knowledge in practice"; "I was given the opportunities to take responsibility at work"; "The support and training I received during my internship were adequate", etc.). Finally, on the basis of the experience that they gained during the internship, the students were asked if they had any suggestions for their curriculum so that the graduates would be better prepared for the working environment. The fourth and last section of the questionnaire included typical demographic questions, such as gender, age, the student's appointment as full- or part-time, the year of study, etc.

The academics' questionnaire included 37 questions and subquestions that were also divided into four sections. The first section referred to the SD awareness of the academic staff; the identification of the five most important SDGs for the RM sector; the integration of the SD principles into the existing curriculum; their satisfaction with regard to the knowledge that is acquired by the students on the SD principles and goals from the existing curriculum; the evaluation of the existing curriculum with regard to its contribution to the students' theoretical and technical knowledge, social skills, etc.; and the role of internships in the enhancement of the students' competencies. Moreover, the academics were asked to state their level of agreement or disagreement with a series of statements (e.g.,: "Sustainable Development Goals have opened multiple new research questions across disciplines for both staff and students"; "Education for Sustainable Development is related to the mission and vision of the University"; "I intend to develop/revise my course content in order to put more emphasis on the principles of Sustainable Development";

"Incorporating Sustainable Development principles could help strengthen the partnerships between schools/faculties and other stakeholders and encourage interdisciplinary and cross-curricular work", etc.). The second section explored the most appropriate methods for the enhancement of the students' skills towards the achievement of the SDGs. At first, the participating academics were asked whether they taught courses on SD and, if so, what the main teaching orientations of these courses were (e.g., academic driven, industry oriented, etc.). Then, they were asked to recognise, on the basis of their teaching and research experience, the most appropriate methods for enhancing the students' skills towards the achievement of the SDGs, as well as the main difficulties in incorporating the SD principles into their courses. Finally, the participants were asked to identify which actions/activities (e.g., attending SD-relevant conferences, participating in SD-relevant research projects, assigning SD-relevant BSc, MSc, or PhD theses or student projects, etc.) could trigger their interest in sustainability, and whether they had published a paper on SD in peer-reviewed journals or conference proceedings. The third section investigated the universities' collaborations with the main RM stakeholders (e.g., other HEIs, industrial partners, NGOs, state authorities, etc.) on the SD-related thematic areas. The questionnaire concluded with a series of demographic questions for the identification of the gender, age, year of graduation, current position, and affiliation.

The professionals' questionnaire included 68 questions and subquestions, which were also divided into four sections. The first section involved opinion-and-belief questions that concerned their awareness of the SDGs and the importance of them for the RM sector (i.e., the identification of the five most important SDGs). This section also included questions with regard to the level of agreement or disagreement of the participating professionals with a number of statements (e.g.,: "Education for SD is related to the mission and vision of the Raw Materials industry"; "SD principles assist Raw Materials Engineers to better understand the practical concepts/problems on environmental, social and economic issues stemming from the development of raw materials"; "Incorporating SD principles could help strengthen the partnerships between the Raw Materials Industry, Raw Materials self-employed professionals and other stakeholders (Universities, NGOs, etc.)"; "Most Raw Materials industries, including relevant SMEs today, are engaged in activities towards the achievement of SDGs", etc.). The second section was related to the integration of sustainability into the RM industry and was specifically addressed to RM professionals who are/have been employed in an RM company. In particular, this section asked for the level of agreement or disagreement of the participating professionals with a series of sustainability-related statements (e.g.,: "Company mission reflects commitment to the principles of SD"; "My company maintains an active dialogue with stakeholders to identify and address their concerns regarding sustainable performance"; "My company has specific targets for its sustainable performance and indicators to monitor their achievement"; "My company reports annually the actions taken to improve its sustainable performance, e.g., Corporate Social Responsibility"; "Application of Sustainable Development principles improves the financial performance of my company and offers a competitive advantage"; "Application of Sustainable Development principles improves the social acceptance of my company", etc.). The next section aimed to evaluate the study programmes of the RM schools where the participants completed their undergraduate studies. First, by using a series of agreement/disagreement statements, the professionals were asked to state whether they had had many opportunities to apply sustainable engineering practices in their courses, and whether they had acquired an interdisciplinary understanding of sustainability, and a comprehensive knowledge of economic, environmental, and social sustainability. Then, they were asked to express whether the education that they received during their undergraduate studies satisfied their expectations with regard to their knowledge on SD, as well as to what extent the study programme contributed to the development of their soft skills, their theoretical and technical knowledge, their knowledge related to the application of SD principles, etc. The respondents were also asked to identify, on the basis of their experience, which approaches they considered to be more effective for teaching the SD

principles to undergraduate RM students, and to rank (using a five-point Likert scale) the competencies that should be enhanced in order for young RM engineers to apply the SD principles in the RM sector (e.g.,: "Understanding of risks and opportunities in the Raw Materials sector"; "Creativity and Ability to innovate"; "Understanding of professional and ethical responsibilities"; "Ability to recognise corporate social responsibility"; "Ability to apply practices in an environmentally and legally responsible manner"; "Awareness of impact of engineering solutions in a global, economic, environmental, societal and an overall sustainability context", etc.). Finally, the participants were asked to note whether they had published a paper on SD in peer-reviewed journals or conference proceedings, and how their interest/awareness in sustainability could be enhanced. Moreover, in this questionnaire, the last section consisted of questions about basic demographic information (e.g., gender, age, year of graduation, present employment status, years of experience in RM sector, etc).

Finally, the industry representatives' questionnaire included 45 questions and sub-questions that were organised into four sections. The first section included information about the company (e.g.,: business sector; country location(s) of the company's activities; the total number of full-time employees; the total number of RM engineers employed; and the number of them belonging to the age group between 25 and 34 years). Moreover, this section aimed to examine the opinions of the industry representatives on the five most important SDGs for the RM sector, their familiarity with the SDGs, and the importance to an RM company of achieving the SDGs. Finally, the representatives were asked to rank the overall performance of young RM engineers in terms of the achievement of the SDGs. The second section focused on educational needs. It aimed to identify the competencies of young RM engineers that should be enhanced in order for them to apply the SD principles in the RM sector (the question was the same as in the professionals' questionnaire), and the most appropriate tools for teaching SD skills to undergraduate RM students. The section concluded by asking the participants to recognise the most significant thematic challenges for the RM industry in the next ten years, and to rank the three most important ones for their company. The next section included one question where the respondents were asked to indicate their level of agreement or disagreement with a series of statements that were related to SD and the RM industry (e.g.,: "Company mission reflects commitment to the principles of SD"; "My company has specific targets for its sustainable performance and indicators to monitor their achievement"; "My company has a management team/unit to implement necessary actions and monitor sustainable performance"; "In my company actions and measures to ensure sustainable performance are applied in reaction to pressures and/or reactions of one or more stakeholder groups"; "Application of SD principles improves the social acceptance of my company", etc.). The fourth and last section referred to the training of employees and lifelong learning (LLL). The participants were asked to provide information about the annual budget for the training of RM engineers, and about the subjects of these training programs in their company. They were also asked about the frequency that the company's RM engineers are trained on SD issues, and which methods are used for this aim (e.g., support in obtaining a certificate on specific skills, technical training by in-house senior staff, external training by HEIs or specialized training bodies, etc.). Furthermore, they were asked whether, and at what level, the company cooperated with academia, industrial partners, NGOs, and state authorities on the thematic areas that are related to SD, etc. Finally, the industry representatives were asked to identify the ways in which they could assist HEIs in the development of a RM engineering curricula that is focused on the enhancement of skills for the achievement of the SDGs in the RM sector. Along the same lines, the participants were asked about the support that they could provide for internships for RM undergraduate students (i.e., duration of internship, number of students accepted, content, and purpose of acceptance). Moreover, they were asked to highlight the obstacles and challenges that their company faces with regard to the implementation of internships (e.g., limited availability of trainers for interns, budget unavailability, the bureaucratic procedures for the registration of interns, etc.).

From the abovementioned set of questions that were used in the EnAct-SDGs project, the present article focuses on the analysis of the responses that were collected on two survey questions. The first question is, "Which of the following SDGs are most important in the RM sector?", and it was addressed to all four stakeholder groups. From the list of 17 SDGs, the participants were asked to select and rank the five goals that, according to their opinions, were the most important. A scale from 5 to 1 was used to indicate the ranking range from "extremely important" (5) to "important" (1). The zero value was used to represent the rest of the twelve of the seventeen SDGs that were not selected as important by the participant. Moreover, the second question that is analysed in this article is, "What thematic areas do you expect to face the Raw Materials industry in the next ten years?", and it was specifically addressed to the industry representative stakeholder group. The participants were asked to identify and rank the three thematic areas from a list of eight challenges that they considered to be the most important for their company. A scale from 3 to 1 was used to indicate the range ranking, from "extremely important" to "important", whereas the zero value was used for the other thematic areas that were related to challenges that were not selected as important.

2.2. Data Collection and Analysis

The convenience sampling approach was adopted as the sampling method, given that the target groups were not easily accessible during the period when the EnAct survey was conducted because of COVID-19 pandemic restrictions. This approach was assessed as appropriate for the aim of the present study since the objective is to examine the relationship, and not the precision, of population estimates [26]. The data were collected through Limesurvey, which is an online survey tool, during the period from 24 June to 11 September 2020 for the students and academia groups, and from 1 July to 11 September 2020 for the professional and industry groups. In order to effectively reach the target groups, a number of dissemination methods were applied that took into account the personal data protection rules of the institutions. The dissemination plan included posts on the EnAct-SDGs website, partner universities' websites, the websites of the EIT RawMaterials hubs involved (e.g., RCGREECE and RCKOSICE), the EIT RawMaterials Infocenter News, and the social media of partners/hubs. Moreover, newsletters and emails were sent through the EnAct-SDGs stakeholders' database, the mailing lists of the partners/hubs, and the RIS Task Partners' contacts.

For the analysis of the results (i.e., the responses to the questionnaires), descriptive statistics were used, as well as statistical hypotheses, in order to assess the effect of the specific stakeholder groups on ranking the relevant importance of the SDGs in each country. More specifically, the nonparametric statistical test of Kruskal–Wallis [27] was used, with a significance level of 95%. The Kruskal–Wallis test was selected as an alternative to the one-way ANOVA test. In the "Results" section of this article, the statistics of the Kruskal–Wallis test (critical value (H), *p*-value, and degree of freedom (df)) are reported in the cases of significant differences between the examined groups (when $p\text{-value} \leq 0.05$).

Moreover, the effect size (Cohen's d) of the Kruskal–Wallis test is provided, according to Cohen [28], in order to identify the importance of the test results in actual units of response ("the degree to which the phenomenon is present in the population"). Generally, for the effect size (d_{coh}), it is desirable to take values larger than 0.5, while values less than 0.2 indicate that the identified differences are negligible [28,29].

For the first question (i.e., "Which of the following SDGs are most important in the RM sector?"), the data that were collected from the four different stakeholder groups were included in a single dataset and were analysed. For each SDG, the average ranking was calculated per stakeholder group. Moreover, the unweighted average of the four stakeholder groups was computed for each country, so that the sample size of the respective group did not affect the overall average ranking of a specific SD goal. Furthermore, the classification of the EBRD on the type of impact that the RM sector has on the specific SDGs [10] (i.e., very direct, moderately direct, indirect), and the enhancement or mitigation

effects, was adopted for the interpretation of the results. Thus, the average ranking for the importance of a specific SDG on the RM sector was calculated at a country level.

For the second question (i.e., "What thematic areas do you expect to face the Raw Materials industry in the next ten years?"), which was addressed to the RM industry representatives, a similar analysis took place. For each thematic area/challenge, the average ranking was calculated per country of origin. Then, the results were presented in a radar (spider) chart for their comparative evaluation.

The sample characteristics and their distributions are described below. As is seen in Table 1, a total of 423 people participated in the online surveys: 114 from Greece; 63 from Poland; 188 from Slovakia; and 58 from other countries, from different stakeholder groups (Table 1). This study focuses on the results of the three ESEE countries: Greece, Poland, and Slovakia.

Table 1. Number of completed questionnaires.

Country	Students	Academic Staff	Professional Engineers	Industry Representatives	Total
Greece	48	24	26	16	114
Poland	15	21	15	12	63
Slovakia	55	55	57	21	188
Other	14	16	24	4	58
Total	132	116	122	53	423

From the 132 students who participated in the student's survey, 43.7% came from FMEPCG-TUKE (Slovakia); 36.4% from SMME-NTUA (Greece); and 11.4% from FMG-AGH (Poland). The responses of students (10.6%) from other countries, faculties, or schools were not taken into account in the present study. Approximately 57.6% of the students were male and 42.4% were female. With regard to age, 57.6% of the students were between 18–23 years old, and 35.6% were between 24–30 years old, and 84.6% of the students who responded to the survey were enrolled in the third or higher study year of their programme.

Furthermore, 116 responses were recorded from the academic staff: 47.7% from FMEPCG-TUKE (Slovakia); 20.7% from SMME-NTUA (Greece); 18.1% from FMG-AGH (Poland); and 13.8% from other countries, faculties, or schools that were not taken into account in the present study. Nearly 60% of the participants were male, and 40% were female. Most of the academic staff who participated in the survey were under the age of 40 years. With regard to the different academic positions, 33.3% of the participants were professors and associate professors or senior researchers; 23.4% were assistant professors, researchers, or lecturers; 24.3% were post-docs or assistant researchers; and 18.9% were PhD candidates.

From the 122 professional engineers, 46.7% graduated from FMEPCG-TUKE (Slovakia); 21.3% from SMME-NTUA (Greece); 12.3% from FMG-AGH (Poland); and 19.7% from other countries, faculties, or schools that were not taken into account in the present study. Approximately six out of ten were male (59%) and under 40 years old (61.4%). Most of the professionals who were over 40 years old graduated from SMME-NTUA (Greece), with 57.7% of the Greek professionals who participated in the survey being 40 years of age or older. A total of 27.9% of the participants stated that they did not have any experience in the RM sector; 43.4% had 1 to 10 years of experience; and 27% had more than 15 years of experience.

A total of 53 RM industry representatives completed the survey. A total of 22.6% of them reported that their companies operated in Poland; 30.2% operated in Greece; 39.6% operated in Slovakia; and 7.5% operated in other countries that were not taken into account in the present study. With regard to the gender distribution, 71.7% of the participants from the industry were male, and 28.3% were female. In terms of the corporate posts, 62.2% of the participants were managers or CEOs; 26.4% were human resources managers or directors; and 11.3% were technical staff. Moreover, 30.2% of all the participants stated

that the business sector of their company is "Mines and quarries", whereas none of the Slovakian participants stated that their companies belonged to the "Mines and quarries" sector. Finally, with regard to the company size, 35.8% of the respondents were employed in companies with 1 to 49 employees; 15.1% in companies with 50 to 99; 11.3% in companies with 100 to 149; and 37.7% in companies with more than 200.

3. Results

The responses of the stakeholders during the survey for the question, "Which of the following SDGs are most important in the RM sector?", are analysed below.

The overall ranking results with regard to the significance of the SDGs in the RM sector for all the stakeholder groups (i.e., students, academic staff, professionals, RM industry representatives) from Greece, Poland, and Slovakia are presented in Figures 2–4. In these figures, the 17 SDGs are ranked in descending order of significance on the basis of the unweighted averages of the views of the stakeholder groups. The results indicate that SDGs 9 (Industry, Innovation, and Infrastructure), 8 (Decent Work and Economic Growth), and 7 (Affordable and Clean Energy) were ranked among the five most important SDGs for the RM sector, by all the countries.

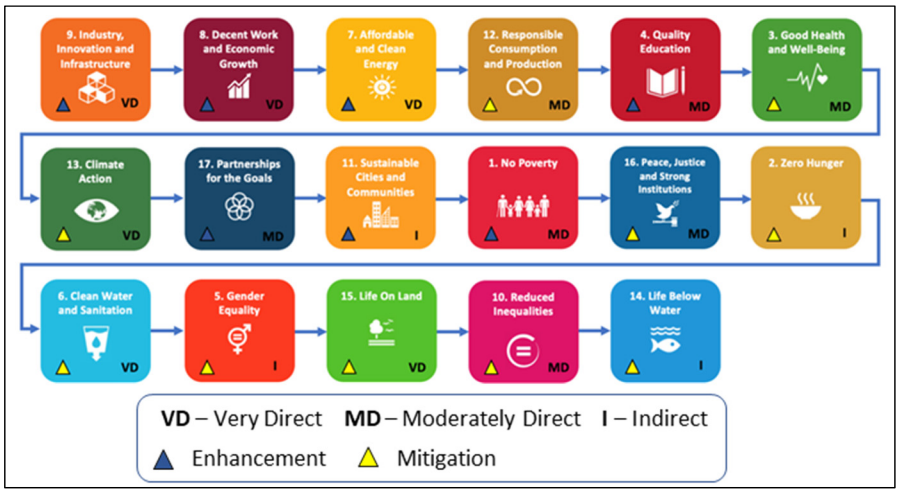

Figure 2. Ranking based on the significance of SDGs for the RM sector reported by the Greek stakeholder groups (i.e., students, academic staff, professionals, RM industry representatives). Type of impact codified according to the EBRD study, 2017 [10].

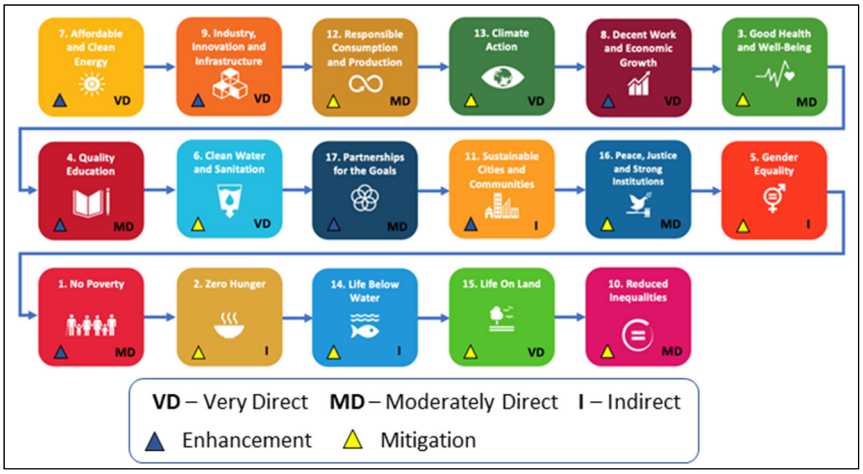

Figure 3. Ranking based on the significance of SDGs for the RM sector reported by the Polish stakeholder groups (i.e., students, academic staff, professionals, RM industry representatives). Type of impact codified according to the EBRD study, 2017 [10].

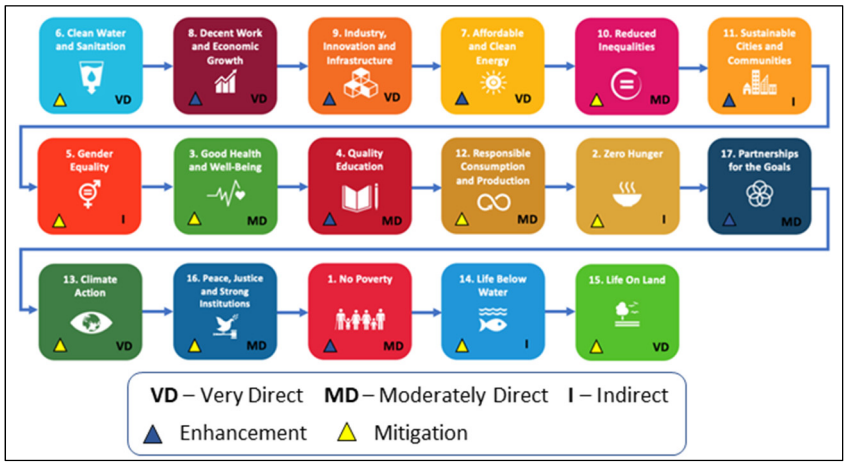

Figure 4. Ranking based on the significance of SDGs for the RM sector reported by the Slovakian stakeholder groups (i.e., students, academic staff, professionals, RM industry representatives). Type of impact codified according to the EBRD study, 2017 [10].

According to the views of the Greek stakeholders, the five most important SDGs for the RM sector are:

1. SDG 9 (Industry, Innovation, and Infrastructure);
2. SDG 8 (Decent Work and Economic Growth);
3. SDG 7 (Affordable and Clean Energy);
4. SDG 12 (Responsible Consumption and Production);
5. SDG 4 (Quality Education).

The overall ranking results for all 17 SDGs are presented in Figure 2. In the same figure, the types of impacts that the RM sector has on the specific SDGs, as codified in the EBRD analysis [10], are also presented. According to the Kruskal–Wallis test results, differences were observed between the stakeholders' views for the relative significance of 3 of the 17 SDGs. The Greek academic staff evaluated SDG 6 (Clean Water and Sanitation) with higher importance compared to the other three Greek stakeholder groups ($H = 10.580$, $p = 0.014$, $df = 3$, $d_{coh} = 0.544$). The Greek students evaluated SDG 7 (Affordable and Clean Energy) with a lower rank than the other three groups ($H = 11.239$, $p = 0.011$, $df = 3$, $d_{coh} = 0.569$). Moreover, SDG 12 (Responsible Consumption and Production) was ranked higher by the Greek professionals and the Greek industry than the other groups ($H = 10.410$, $p = 0.015$, $df = 3$, $d_{coh} = 0.538$).

On the basis of the views of all of the groups of the Polish stakeholders, the five most significant SDGs for the RM sector are the following:

1. SDG 7 (Affordable and Clean Energy);
2. SDG 9 (Industry, Innovation, and Infrastructure);
3. SDG 12 (Responsible Consumption and Production);
4. SDG 13 (Climate Action);
5. SDG 8 (Decent Work and Economic Growth).

The overall ranking results for all 17 SDGs are presented in Figure 3. The statistical analysis revealed that SDGs 7 (Affordable and Clean Energy) and 12 (Responsible Consumption and Production) presented significant differences between the four stakeholder groups. SDG 7 was ranked higher by the Polish professionals and the Polish industry representatives ($H = 17.865$, $p = 0.000$, $df = 3$, $d_{coh} = 1.161$), and SDG 12 was assessed with higher importance by the Polish industry representatives than by the other three Polish stakeholder groups ($H = 10.373$, $p = 0.016$, $df = 3$, $d_{coh} = 0.756$).

According to the views of all of the groups of the Slovakian stakeholders, the five most important SDGs for the RM sector are:

1. SDG 6 (Clean Water and Sanitation);
2. SDG 8 (Decent Work and Economic Growth);
3. SDG 9 (Industry, Innovation, and Infrastructure);
4. SDG 7 (Affordable and Clean Energy);
5. SDG 10 (Reduced Inequalities).

The overall ranking results for all 17 SDGs are presented in Figure 4. From the four Slovakian stakeholder groups, only the students ranked the importance of SDG 4 (Quality Education) higher than the other groups ($H = 11.001$, $p = 0.003$, $df = 3$, $d_{coh} = 0.426$). This was the only statistical difference that was observed.

Contrary to the limited differences that were observed in the responses of the specific stakeholder groups of the same country, variability was observed between the responses on a country level. The Polish stakeholders ranked SDGs 7 (Affordable and Clean Energy) and 13 (Climate Action) higher than the Greek and Slovakian stakeholders did ($H = 9.431$, $p = 0.009$, $df = 2$, $d_{coh} = 0.290$; and $H = 30.014$, $p = 0.000$, $df = 2$, $d_{coh} = 0.579$, respectively). The Greek and Polish stakeholders valued SDGs 9 (Industry, Innovation, and Infrastructure) and 12 (Responsible Consumption and Production) higher ($H = 20.056$, $p = 0.000$, $df = 2$, $d_{coh} = 0.458$; and $H = 32.530$, $p = 0.000$, $df = 2$, $d_{coh} = 0.607$, respectively). SDGs 5 (Gender Equality) and 6 (Clean Water and Sanitation) were ranked higher by the Slovakian participants, while they were ranked quite high by the Polish participants, and were ranked less high by the Greek participants ($H = 32.777$, $p = 0.000$, $df = 2$, $d_{coh} = 0.610$; and $H = 38.518$, $p = 0.000$, $df = 2$, $d_{coh} = 0.670$, respectively). The Slovakian stakeholders considered SDGs 10 (Reduced Inequalities) and 11 (Sustainable Cities and Communities) to be higher priorities than the Polish and Greek participating stakeholders did ($H = 50.002$, $p = 0.000$, $df = 2$, $d_{coh} = 0.782$; and $H = 6.326.518$, $p = 0.042$, $df = 2$, $d_{coh} = 0.220$, respectively).

The overall ranking results with regard to the significance of the SDGs in the RM sector per stakeholder group for all three ESEE countries that participated in the survey are presented in Figures 5–8. The figures include the 17 SDGs sorted in descending order of significance on the basis of the unweighted averages of the three ESEE countries for each stakeholder group. The results indicate, again, that SDGs 9 (Industry, Innovation, and Infrastructure), 8 (Decent Work and Economic Growth), and 7 (Affordable and Clean Energy) were ranked among the five most important SD goals for the RM sector, by all the stakeholder groups.

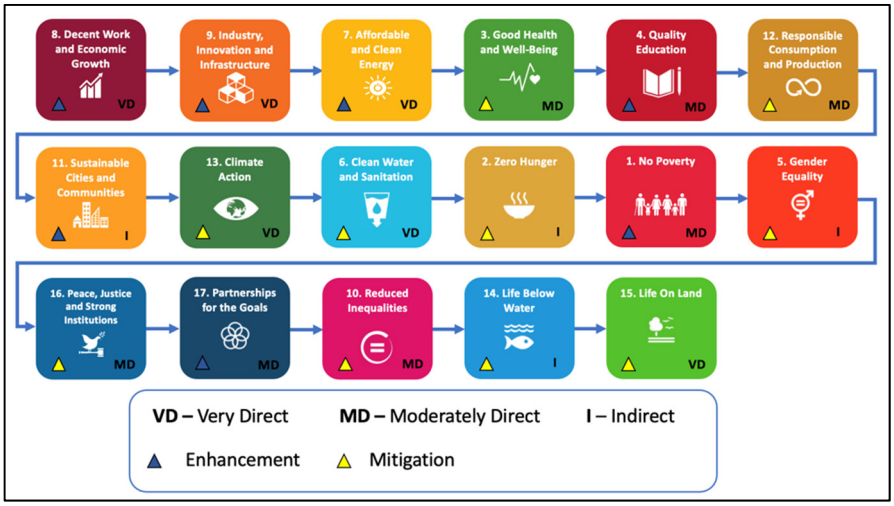

Figure 5. Ranking based on the significance of SDGs for the RM sector reported by students of the 3 ESEE countries. Type of impact codified according to the EBRD study, 2017 [10].

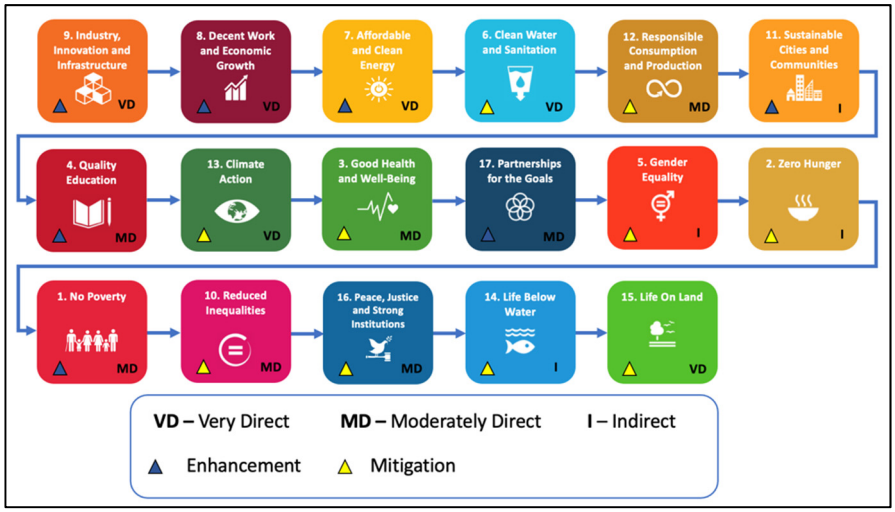

Figure 6. Ranking based on the significance of SDGs for the RM sector reported by academic staff of the 3 ESEE countries. Type of impact codified according to the EBRD study, 2017 [10].

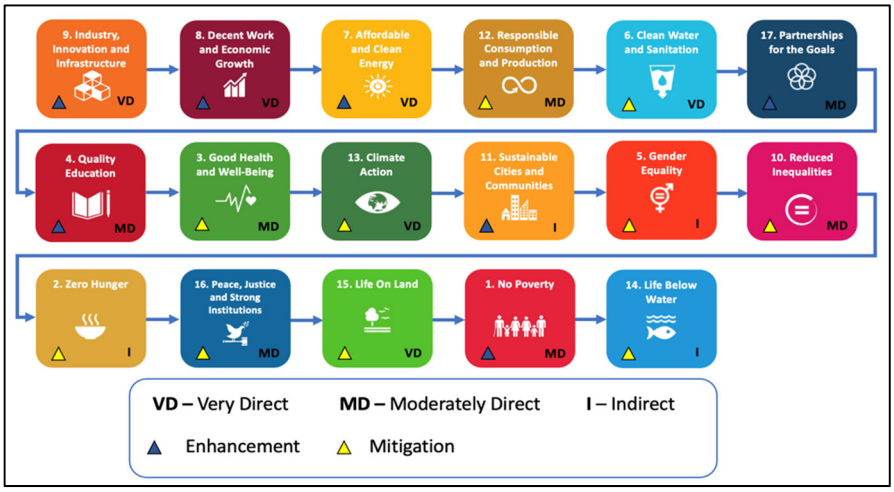

Figure 7. Ranking based on the significance of SDGs for the RM sector reported by professional engineers of the 3 ESEE countries. Type of impact codified according to the EBRD study, 2017 [10].

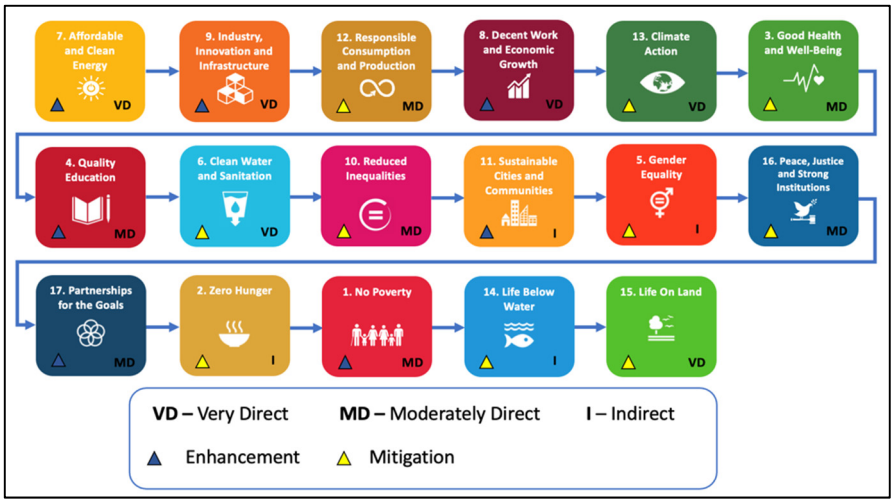

Figure 8. Ranking based on the significance of SDGs for the RM sector reported by industry representatives of the 3 ESEE countries. Type of impact codified according to the EBRD study, 2017 [10].

The students/future RM engineers of the three ESEE countries ranked the following SDGs as the five most important for the RM sector:

1. SDG 8 (Decent Work and Economic Growth);
2. SDG 9 (Industry, Innovation, and Infrastructure);
3. SDG 7 (Affordable and Clean Energy);
4. SDG 3 (Good Health and Well-Being);
5. SDG 4 (Quality Education).

The overall rankings for all 17 SDGs are presented in Figure 5.

The academic staff of the three ESEE countries considered that, for the RM sector, the five most important SDGs are:

1. SDG 9 (Industry, Innovation, and Infrastructure);
2. SDG 8 (Decent Work and Economic Growth);
3. SDG 7 (Affordable and Clean Energy);
4. SDG 6 (Clean Water and Sanitation);
5. SDG 12 (Responsible Consumption and Production).

The overall rankings for all 17 SDGs are presented in Figure 6.

According to the perceptions of the professional engineers from Greece, Poland, and Slovakia, the five most important SDGs for the RM sector are:

1. SDG 9 (Industry, Innovation, and Infrastructure);
2. SDG 8 (Decent Work and Economic Growth);
3. SDG 7 (Affordable and Clean Energy);
4. SDG 12 (Responsible Consumption and Production);
5. SDG 6 (Clean Water and Sanitation).

The overall rankings for all 17 SDGs are presented in Figure 7.

The industry representatives ranked the following SDGs as the top five most significant SDGs for the RM sector:

1. SDG 7 (Affordable and Clean Energy);
2. SDG 9 (Industry, Innovation, and Infrastructure);
3. SDG 12 (Responsible Consumption and Production);
4. SDG 8 (Decent Work and Economic Growth);
5. SDG 13 (Climate Action).

The overall rankings for all 17 SDGs are presented in Figure 8.

A number of differences were observed in the rankings of the specific stakeholder groups from the three ESEE countries. The students ranked SDG 3 (Good Health and Well-Being) higher than the other stakeholder groups did. On the other hand, the professional engineers evaluated SDG 17 (Partnerships for the Goals) higher than the other stakeholder groups did. SDG 6 (Clean Water and Sanitation) was ranked higher by academic staff and professional engineers, as compared to the students and industry representatives. Similar results were recorded by all four stakeholder groups with regard to the rankings of SDGs 14 (Life Below Water) and 15 (Life on Land), with these SDGs considered to be the least significant for the RM sector.

On the basis of the stakeholders' views from the three examined ESEE countries, the averages of the SDG rankings on the basis of the type of impact that the RM sector has on these SDGs with regard to its directness, (i.e., indirect, moderately direct, very direct) and to their enhancement or mitigation for the achievement of the respective SDG, are presented in Figure 9. The stakeholders from the three countries selected as more significant, with a higher frequency, the SDGs that are directly and positively impacted by the RM-sector activities. In Figure 9, significant differences in the rankings on a country level can also be observed. For example, the Greek and Polish stakeholders ranked the SDGs that were directly and moderately impacted by the RM sector as more significant than the SDGs that were indirectly impacted by the sector. On the contrary, the Slovakian stakeholders

ranked the SDGs that were moderately and indirectly impacted by the RM sector in a similar manner.

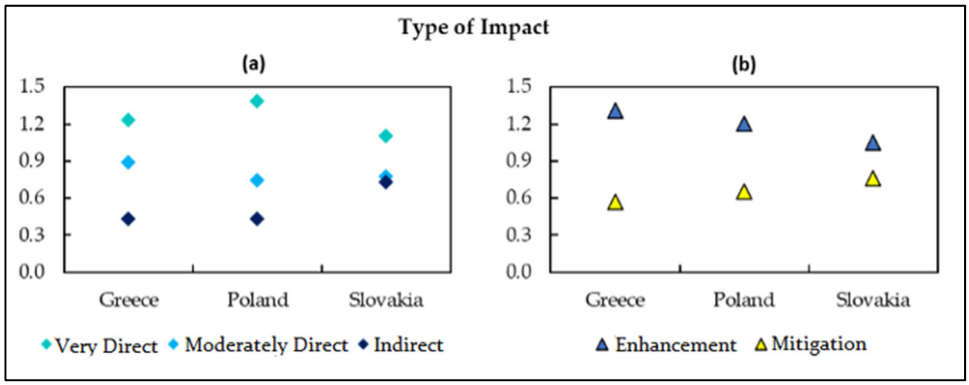

Figure 9. Summary of the stakeholder survey results with regard to the average significance of SDGs in the RM sector for the 3 ESEE countries examined, as per the type of impact: (**a**) very direct, moderately direct, and indirect; and per (**b**) enhancement or mitigation. Type of impact codified on the basis of the EBRD study, 2017 [10].

The responses to the second question, "What thematic areas do you expect to face the Raw Materials industry in the next ten years?", are analysed below. The compiled results are presented in Figure 10, with the high values indicating the most challenging thematic areas. The three lines with different colours illustrate the respective averages of the thematic areas for the countries that were examined.

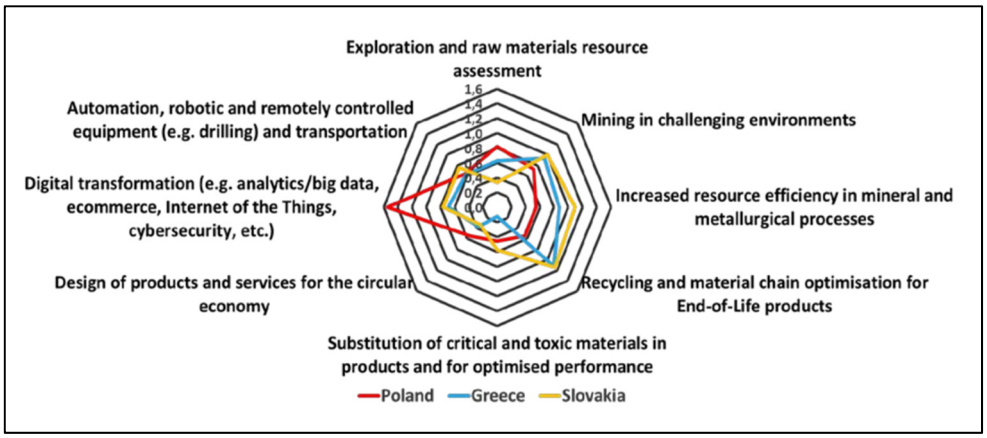

Figure 10. Averages ratings of thematic areas that the RM industry will face in the next ten years, on the basis of the views of the industry representatives of the 3 ESEE countries.

The Polish industry representatives indicated the thematic area of digital transformation as a priority. Moreover, they expect that the exploration and RM resource assessment and mining in challenging environments are the thematic areas that will present challenges that the RM industry will have to face in the decade to come. On the other hand, the three most important areas that were recorded by the Greek and Slovakian RM industries are similar and include: recycling and material chain optimization for end-of-life products; increased resource efficiency in mineral and metallurgical processes; and mining in challenging environments.

4. Discussion and Conclusions

The results of the survey reveal convergences, but also differences, between the three ESEE countries with regard to the relative importance that specific SDGs have to the RM sector. After reviewing them, it was concluded that the differences in the opinions of the

participants with regard to the relative importance that specific SDGs have to the RM sector were mostly observed on a country level, which means that the participants from the same country had more similar responses than the participants that belonged to the same stakeholder group. The Greek participants recognized SDG 9 (Industry, Innovation, and Infrastructure) as the most significant SDG for the RM sector, with the Polish stakeholders identifying SDG 7 (Affordable and Clean Energy), and the Slovakian participants identifying SDG 6 (Clean Water and Sanitation). Furthermore, as evidenced by the stakeholder perceptions, the ranking of the SDGs is highly dependent on the type of impact that the RM sector has on these SDGs. The participants from the three ESEE countries that were examined ranked highly the three SDGs that are directly and positively impacted by the activities of the sector: 7 (Affordable and Clean Energy); 8 (Decent Work and Economic Growth); and 9 (Industry, Innovation and Infrastructure).

The RM sector is active in Greece, Poland, and Slovakia. Greece and Poland are countries with extensive geological potential in metallic and industrial minerals and ornamental stones, with long mining traditions and increased raw materials business potential, and with leading international mining companies that are active in the sector. Slovakia has low-to-medium mining-business potential, and the mining sector presently makes a lower contribution to its economy compared to those of Greece and Poland [10]. The relevant importance of mining in the abovementioned countries is also noted by the International Council of Mining and Metals (ICMM) in the recently published report on the "Role of Mining in National Economies—Mining Contribution Index (MCI) 5th edition" [30]. The MCI is a composite of four indicators that capture the different aspects of the contribution of mining to national economies. For 2018, the MCI, which consists of the indicators, "mineral and metal export contribution in 2018", "increase/decrease in mineral and metal export contribution between 2013–2018", "mineral production value expressed as a percentage of GDP in 2018", and "mineral rents as a percentage of GDP in 2018", was 63.8 for Greece, 51.8 for Poland, and 37.2 for Slovakia [30].

Moreover, according to the 2021 Europe Sustainable Development Report, [31], the overall SDG Index Score, which measured the progress towards achieving all 17 SDGs for Greece, Poland, and Slovakia in 2021, was 64.8, 71.0, and 70.0, respectively, on a scale from 50 to 90 [31]. In terms of the achievement of the SDG that is considered to be the most important for the sector, additional measures are needed in all of the ESEE countries that were examined. According to this report [31], significant challenges remain for the implementation of SDG 9 (Industry, Innovation and Infrastructure) in Greece, but the country is on track towards the implementation of that goal. The challenges that remain for the implementation of SDG 7 (Affordable and Clean Energy) in Poland are significant, considering the present low share of renewable energy in the country's energy mix, and additional effort is required in order to ensure that it is on a progressive track for achieving SDG 7 [31]. From the three ESEE countries that were examined, Slovakia presents the higher index with regard to the achievement of SDG 6 (Clean Water and Sanitation), with only some challenges that remain to be resolved, and with the country moderately increasing its performance towards its achievement [31].

Moreover, and in order for the RM sector to successfully implement the principles of SD in its practices, it is important to recognise, and to be prepared for, the challenges that will be faced in the future. On the basis of the industry's perceptions, digital transformation, recycling and material chain optimization for end-of-life products, and increased resource efficiency in mineral and metallurgical processes are considered to be the three more significant thematic areas that will be faced by the industry in the coming decade.

On the basis of the stakeholders' views on the presented survey, the strategy for the cooperation of HEIs and industry is considered critical for the achievement of the SDGs by the RM sector. The main pathway for the successful implementation of the SDGs by the sector is education on SD principles, from academic staff to students; the exposure to and application of those principles by the students in their engineering studies; the knowledge and awareness of the professional engineers as to the positive and adverse impacts of the

RM sector on SD and the achievement of the SDGs; and the adaptation of SD practices by the industries [17,18].

The results of the present study have been taken into consideration in the Action Plan that was developed within the EnAct-SDGs project for the period, 2022–2025. This Action Plan will function as a driver for the modernization of RM education practices in order to ensure: the incorporation of the SD principles into the educational programmes of the ESEE universities; the strengthening of the university–business cooperation; and the further development of the skills, and an increase in the capacities, of university graduates and RM professionals. Nevertheless, it is worth noting that the findings of the survey should be seen as a first attempt to decode the importance and the challenges of SD for the RM sector. Future surveys ought to be extended to a larger sample of stakeholders, and they should also include participants from other countries. In any case, when evaluating the findings of the stated preference surveys, it should always be taken into account that the reliability of the results depends on the trust and consistency of the respondents.

Author Contributions: Conceptualization, S.T., G.V. and K.A.; Data curation, S.T.; Formal analysis, G.V.; Investigation, D.D.; Methodology, G.V. and A.G.; Supervision, K.A.; Writing–original draft, S.T.; Writing–review & editing, D.D. and K.A. All authors have read and agreed to the published version of the manuscript.

Funding: The research data that is presented in this article were obtained within the EnAct-SDGs project, No. 19258, which was funded by EIT RawMaterials, which is gratefully acknowledged.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: The study was conducted according to the General Data Protection Regulation (Regulation No 2016/679). Ethical review and approval were waived for this study because the data were collected through an anonymous online questionnaire, and no sensitive personal data were requested.

Data Availability Statement: Not applicable.

Acknowledgments: The authors would like to thank the colleagues from AGH University of Science and Technology, Technical University of Kosice's (TUKE), and the other partners of the EnAct project, such as the Montan Universität Leoben (MUL), Technische Universität Bergakademie Freiberg (TUBAF), Uni Trento, Hub Innovazione Trentino S.c.a.r.l. (HIT), and the industrial partner, MYTILINEOS, for their contribution to the preparation and dissemination of the survey.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Mancini, L.; Sala, S. Social impact assessment in the mining sector: Review and comparison of indicators frameworks. *Resour. Policy* **2018**, *57*, 98–111. [CrossRef]
2. European Commission EIP on Raw Materials—Raw Materials Scoreboard. 2016. Available online: https://rmis.jrc.ec.europa.eu/?page=scoreboard2016 (accessed on 28 February 2022).
3. Franks, D.M.; Davis, R.; Bebbington, A.J.; Ali, S.H.; Kemp, D.; Scurrah, M. Conflict translates environmental and social risk into business costs. *Proc. Natl. Acad. Sci. USA* **2014**, *111*, 7576–7581. [CrossRef] [PubMed]
4. United Nations Transforming Our World: The 2030 Agenda for Sustainable Development | Department of Economic and Social Affairs. Available online: https://sdgs.un.org/2030agenda (accessed on 28 February 2022).
5. European Commission Making Raw Materials Available for Europe's Future Wellbeing—Proposal for a European Innovation Partnership on Raw Materials; European Commission: Brussels, Belgium. 2012. Available online: http://www.euromines.org/what-we-do/european-innovation-partnership-raw-materials (accessed on 28 February 2022).
6. European Commission the New European Consensus on Development 'Our World, Our Dignity, Our Future'. Joint Statement by the Council and the Representatives of the Governments of the Member States Meeting within the Council, the European Parliament and the European Commission; Official Journal of the European Union: C 210/1, 30.06.2017. Available online: https://www.2013-2021sinergiased.org/index.php/revista/item/138 (accessed on 28 February 2022).
7. EIT Raw Materials. Strategic Agenda 2018-22 of EIT RawMaterials. 2018. Available online: https://eitrawmaterials.eu/wp-content/uploads/2018/10/EIT-RawMateraisl_Strategic-Agenda_2018_2022.pdf (accessed on 28 February 2022).

8. Mancini, L.; Vidal Legaz, B.; Vizzarri, M.; Wittmer, D.; Grassi, G.; Pennington, D.; European Commission; Joint Research Centre. *Mapping the Role of Raw Materials in Sustainable Development Goals: A Preliminary Analysis of Links, Monitoring Indicators and Related Policy Initiatives*; Publication Office of the European Union: Luxembourg, 2019; ISBN 978-92-76-08385-6.
9. Columbia Center on Sustainable Investment (CCSI); UNDP; UN Sustainable Development Solutions Network (SDSN); World Economic Forum. Mapping Mining to the Sustainable Development Goals: An Atlas. 2016, p. 77. Available online: https://www.unsdsn.org/ (accessed on 28 February 2022).
10. *EBRD Extractive Mining Industries Strategy, 2018–2022. As Approved by the Board of Directors on 13 December 2017*. 2017. Available online: https://www.ebrd.com/documents/natural-resources/mining-operations-policy.pdf (accessed on 28 February 2022).
11. UNESCO. United Nations decade of education for sustainable development 2005–2014. In Proceedings of the International Implementation Scheme, Draft 2005, Paris, France, 11 August 2005.
12. Gray, B.; Purdy, J. *Collaborating for Our Future*; Oxford University Press: Oxford, UK, 2018; Volume 1, ISBN 978-0-19-878284-1.
13. Senge, P.M.; Smith, B.; Kruschwitz, N.; Laur, J.; Schley, S. *The Necessary Revolution: How Individuals and Organizations Are Working Together to Create a Sustainable World*, 1st ed.; Senge, P.M., Ed.; Doubleday: New York, NY, USA, 2008; ISBN 978-0-385-51901-4.
14. Leicht, A.; Heiss, J.; Byun, W.J.; UNESCO. *Issues and Trends in Education for Sustainable Development*; UNESCO Publishing: Paris, France, 2018; ISBN 978-92-3-100244-1.
15. Joyce, A. Massive Open Online Courses for Education for Sustainable Development. *Bruxellista* **2017**, *12*, 10187.
16. Lamb, F. *Engineering Graduates for Industry*; Royal Academy of Engineering: London, UK, 2010; ISBN 978-1-903496-52-7.
17. Graaff, E. *Management of Change: Implementation of Problem-Based and Project-Based Learning in Engineering*; Sense Publisher: Rotterdam, The Netherlands, 2007; ISBN 978-90-8790-013-7.
18. Trowler, P.; Saunders, M.; Knight, P. *Change Thinking, Change Practices: A Guide to Change for Heads of Department, Programme Leaders and Other Change Agents in Higher Education*; Learning and Teaching Support Network: York, UK, 2003; ISBN 978-1-904190-31-8.
19. Collins, K.; Davies, J. Feedback through student essay competitions: What makes a good engineering lecturer? *Eng. Educ.* **2009**, *4*, 8–15. [CrossRef]
20. McCormick, M.; Bielefeldt, A.R.; Swan, C.W.; Paterson, K.G. Assessing students' motivation to engage in sustainable engineering. *Int. J. Sustain. High. Educ.* **2015**, *16*, 136–154. [CrossRef]
21. Cook-Sather, A.; Bovill, C.; Felten, P. *Engaging Students as Partners in Learning and Teaching: A Guide for Faculty*, 1st ed.; The Jossey-Bass Higher and Adult Education Series; Jossey-Bass: San Francisco, CA, USA, 2014; ISBN 978-1-118-43458-1.
22. Sogunro, O.A. Motivating factors for adult learners in higher education. *Int. J. High. Educ.* **2014**, *4*, 22. [CrossRef]
23. Lubicz-Nawrocka, T.M. Students as partners in learning and teaching: The benefits of co-creation of the curriculum. *Int. J. Stud. Partn.* **2018**, *2*, 47–63. [CrossRef]
24. Mulder, K.; Jansen, J. Integrating Sustainable Development in Engineering Education Reshaping University Education by Organizational Learning. 2006. Available online: https://www.researchgate.net/publication/259267171_Integrating_sustainable_development_in_engineering_education_Reshaping_university_education_by_organizational_learning (accessed on 28 February 2022).
25. Proposal for a Global Action Programme on Education for Sustainable Development as Follow-Up to the United Nations Decade of Education for Sustainable Development (DESD) after 2014—UNESCO Digital Library. Available online: https://unesdoc.unesco.org/ark:/48223/pf0000224368 (accessed on 1 March 2022).
26. Diamantopoulos, A.; Schlegelmilch, B.B. Taking the fear out of data analysis. *J. Oper. Res. Soc.* **1998**, *49*, 97–98. [CrossRef]
27. Kruskal, W.H.; Wallis, W.A. Use of ranks in one-criterion variance analysis. *J. Am. Stat. Assoc.* **1952**, *47*, 583–621. [CrossRef]
28. Cohen, J. *Statistical Power Analysis for the Behavioral Sciences, 0 ed.*; Routledge: London, UK, 2013; ISBN 978-1-134-74270-7.
29. Hattie, J. *Visible Learning: A Synthesis of over 800 Meta-Analyses Relating to Achievement*; Routledge: London, UK; New York, NY, USA, 2009; ISBN 978-0-415-47618-8.
30. ICMM. *Role of Mining in National Economies: Mining Contribution Index*, 5th ed.; ICMM: London, UK, 2020.
31. Sustainable Development Solutions Network (SDSN); Institute for European Environmental Policy (IEEP). *The 2021 Europe Sustainable Development Report: Transforming the European Union to Achieve the Sustainable Development Goals*; SDSN: Paris, France; IEEP: Brussels, Belgium, 2021.