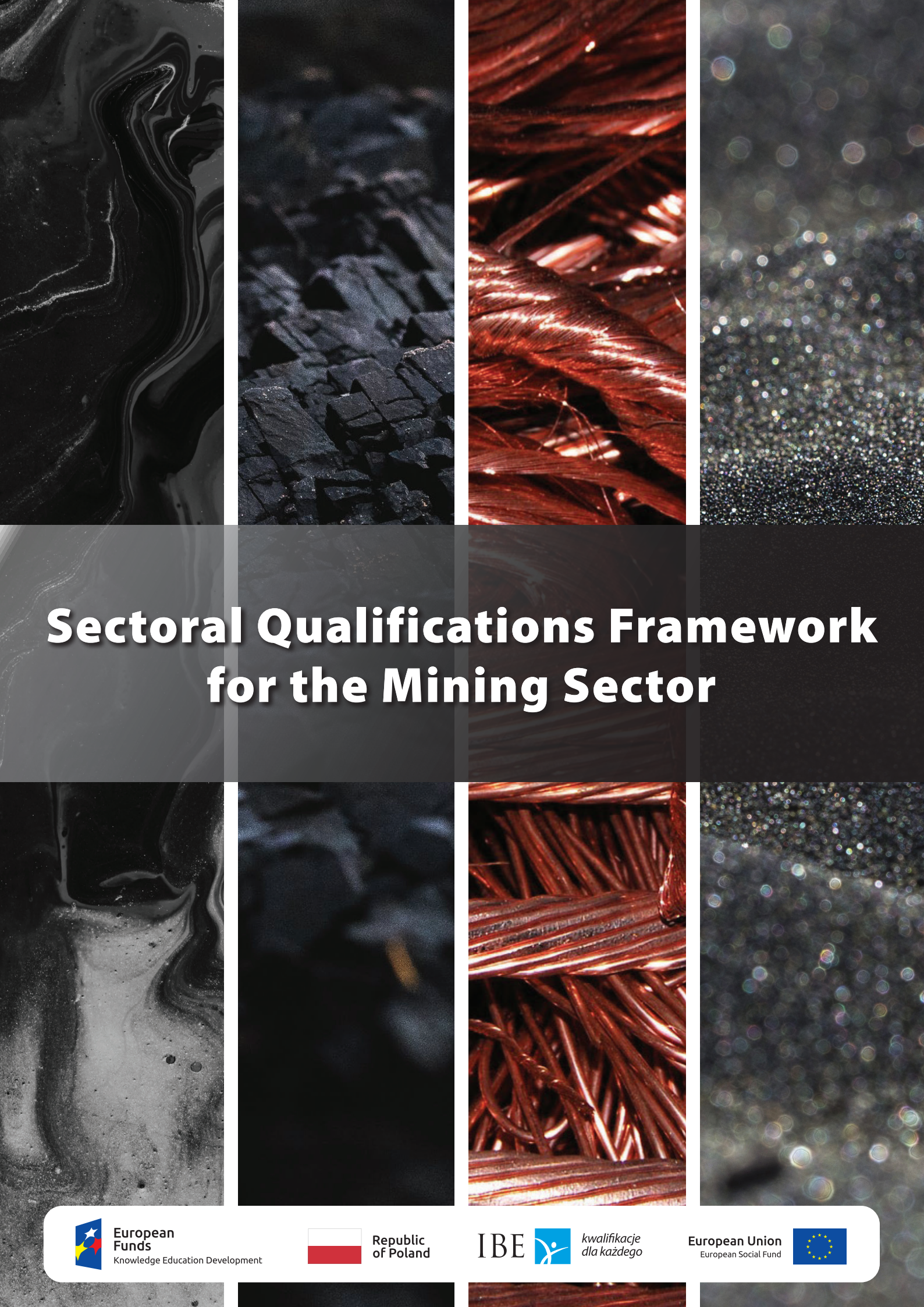

# Sectoral Qualifications Framework for the Mining Sector

European Funds
Knowledge Education Development
Republic of Poland
IBE kwalifikacje dla każdego
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Warsaw 2021

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# Foreword

Among the most important activities performed by the authorities overseeing the mining industry are the supervision of the education of mine workers as well as monitoring the professional preparation of mining crew members and the comprehensive education system which they must attend. This is important because the professional qualifications of miners and the level of these qualifications directly translate into safety for the entire mining industry. A well-trained, competent mining crew will always have an impact on higher safety levels in mines and the optimisation of their operation and development.

Technological progress must implicitly be accompanied by the development of employee training at various levels and fields, including basic labourers as well as middle and senior management, executives and experts. In the mining industry, there can be no concessions when it comes to professional preparation and qualification, since the mechanism for the safe operation of mining and the professional competences of mining crews are closely interconnected. This is why it also must be remembered that without appropriate legislative and scientific support, this process will not function properly and thus will not develop safely.

One of the serious problems faced by mining companies is the lack of employees with reliable and high qualifications. Meanwhile, there is a steadily decreasing number of persons interested in mining education, mainly due to the uncertainty of this industry's future, especially underground mining. These fears are compounded by the deregulation of mining professions and its rather unfavourable effects on employees and employers.

There is an immediate need for solutions encouraging education, a need to define uniform and clear rules for mining qualifications, as well as solutions increasing the mobility of workers, making it possible for specialists in a given field to be employed in various types of mining plants. Therefore, one of the most important initiatives undertaken by the President of the State Mining Authority, as the authority supervising mining, is to indicate the changes needed in the areas of mining qualifications, the authorisations granted to experts in mining plant operations and the training provided in the mining industry.

The analysis conducted while drafting the proposed regulation of the Minister of State Assets on mining and mining rescue qualifications, as well as the experience of mining supervisory authorities gained in the course of confirming mining qualifications, show that the mining qualifications system requires a deeper remodelling, and the required systemic changes can only be made comprehensively, i.e. taking into account changes to mining and geological laws.

For several years now, the need for such changes has been voiced by representatives of universities, scientific research units and the Association of Mining Engineers and Technicians, as well as by employees and employers in the mining sector who are vitally interested in the best possible functioning of the mining industry and are acutely aware of the problematic shortage of appropriately qualified personnel.

A similar situation applies to the need to reform the regulations concerning the authorisations granted to experts for operating mining plants. Serious changes are needed to address the imprecision in the current law regarding the requirements of candidates that enable them to become experts in mining plant operations and the high level of responsibility they bear for the safety of mining work.

We can say today that these needs have been well diagnosed and articulated, but reform in this area will not happen overnight, although all initiators and postulators of these changes would like them to be enacted as soon as possible. Therefore, at this stage, the document "Sectoral Qualifications Framework for the Mining Sector" has even greater significance. This work is already a guide of sorts, both for employers and employees, making it possible to properly organise issues relating to training, qualifications and competences in the mining industry, which in turn will translate into the appropriate selection of mining personnel and their preparation for work, and thus will improve work safety in the sector.

Today's world, in an era of rapid technological progress, poses a challenge for humankind in the need for ongoing learning and development. There is growing social awareness about the process of the obsolescence of once acquired knowledge, skills and social competence, understood as values. The need to improve one's professional competence is an essential condition of human development. The improvement referred to here should take into account individual abilities and predispositions as well as the needs resulting from the specificity of performed work. Adapting and updating one's professional qualifications to the needs of a dynamically changing labour market is today both an employee's duty and professional obligation. The professional development of a human being should especially take into account cognitive value systems and universal values. Universal values in the global dimension should be consistent with the challenges of an information society, as well as take into account the essence of human dignity and freedom. Today, lifelong learning is the basis for gaining a competitive advantage in many sectors of the economy or science.

Researchers from various scientific fields have been conducting empirical studies on the basic factors of competitiveness for many years. In the vast majority of studies, human potential together with social and professional competences are indicated by researchers as the most important factors. It is commonly accepted that the components of these competences include personality traits, attitudes, behaviour, personal culture, the ability to work in a team, as well as professional qualifications, education, knowledge, skills and experience. The catalogue of competence categories is the basis of numerous systematics and divisions. Therefore, for the purposes of this monograph, professional competences will be linked with social competence.

Professional qualifications are one of the important elements that determine our development and the possibility of gaining employment. According to the Integrated Qualifications System, a qualification is "a set of learning outcomes in the categories of knowledge, skills and social competence… whose attainment was… formally confirmed by an authorised awarding body".

For the purpose of this monograph, as well as the recently developed Sectoral Qualifications Framework for the Mining Sector, the team of authors adopted a division of professional qualifications aggregated around three regulations. The first are the vocational qualifications attained in school and higher education. The second are the so-called regulated qualifications. Examples include qualifications awarded on the basis of legal regulations, such as welder's qualifications, or the technical equipment maintenance qualifications awarded by the Office of Technical Inspection. These qualifications are examples of "fast track" vocational qualifications, i.e. providing the authorisation to work in a particular job position. Many regulated professions, apart from requiring a higher education diploma, also involve passing specialist exams or registering with an authorised professional organisation. In addition, if a particular profession is regulated in a given EU country, a person interested in being employed there is required to apply to an authorised institution for the recognition of possessed qualifications and to acquire the right to practice this profession.

The third regulation governs market qualifications. According to the Integrated Qualifications System, such qualifications consist of the set of knowledge and skills required to perform specific professional tasks. Market qualifications can be attained in the process of performing professional work, through courses offered by training firms or by learning on one's own. It does not matter where and how a person acquired the relevant knowledge, skills and social competence. In order to attain a specific professional qualification, e.g. in the field of "HDD data recovery", a person must participate in a validation process which assesses whether the applicant has the required knowledge, skills and social competence. A person who attains such a certificate from an awarding body is guaranteed that this professional qualification will be recognized in EU countries. The list of awarding bodies is available on the website of the Integrated Qualifications System.

In the context of the Sectoral Qualifications Framework for the Mining Sector (SQFM), the importance of national and regional operational programmes that share a common hierarchy of objectives and interventions deserves attention. Taking into account the aforementioned developmental goals of Poland, the financial resources of the European Structural and Investment Funds concentrate on the following financial priorities: an environment conducive to entrepreneurship and innovation, social cohesion and professional activity; a network infrastructure for growth and employment, the environment and effective resource management. The identification of relevant European policy areas, as well as taking into account the provisions of the *Council Recommendation of 22 May 2017 on the European Qualifications Framework for lifelong learning and repealing the recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning* testify to the importance for the EU of issues concerning people's professional qualifications and professional activity. This is also reflected in points 1 and 2 of the above-mentioned Council Recommendation as follows:

1. *Qualifications serve a variety of purposes. They signal to employers what their holders in principle know and are able to do ("learning outcomes"). They may be a prerequisite for accessing certain regulated professions. They help education and training authorities and providers to determine the level and content of learning*

*acquired by an individual. They are also important for an individual as an expression of personal achievement. Therefore qualifications play an important role in raising employability, easing mobility and access to further education.*

2. *Qualifications are the formal outcome of an assessment and validation process by a competent authority and typically take the form of documents such as certificates or diplomas. They determine that an individual has achieved learning outcomes to given standards. Those learning outcomes may be achieved through a variety of paths in formal, non-formal or informal settings, whether in national or international contexts. Information on learning outcomes should be easily accessible and transparent.*

Moreover, given the wide range of interest in the meaning of human work, e.g. by philosophers, physicians, psychologists, anthropologists, economists, sociologists or ethicists, it can be argued that it is one of the fundamental activities affecting the overall development of a person. Therefore, the approach to the subject of qualifications should be interdisciplinary.

Work is inextricably linked with a variety of products: material, spiritual or intellectual, based on individual or collective professional potential. Taking into account the contemporary dynamics of human professional development, Tadeusz Nowacki points to the importance of work for a person, *homo laboriosus*, in the context of the chance to build and create various objects of human work. On the other hand, this outstanding professor defines the person living in a community, *homo societas*, as a being called to communicate among people. He points to the inevitable process of the change in the meaning of work.

In the social dimension, human work today is undergoing a process of dynamic re-evaluation. In the professional dimension, due to the pace of processes relating to information technology, automation and robotics, it is changing even faster, leading to the replacement of humans by highly efficient technological systems. The high labour costs associated with human employment will increasingly favour the widespread use of technological systems. However, it should be emphasised that even the most perfect technological systems will not be able to replace the genius of thinking and creating of over 7.5 billion people on Earth. For this reason also, a responsible approach to the state of educational systems is essential for the sustainable social and economic development of individual countries. On the other hand, increasing the awareness of millions of people of the importance and strength of their competence potential is one of the most important factors of human development.

In analysing the numerous dissertations and scientific works of eminent thinkers of the 20th century, we encounter a diverse approach to the issue of values in human life. Noteworthy is the position presented in a work from 40 years ago by the philosopher and sociologist Jan Szczepański. In his book *Sprawy ludzkie* [Human Affairs] he wrote: "In any case, it is not the individual who is of value, but value is given to him by what he brings to society and how he contributes to increasing its importance and strength" (Szczepanski, 1988). Hence the indication above of the importance of the state's responsibility for an education that is effective and wise,

as well as the individual's responsibility for personal development and lifelong learning. This is an example of the synergy of combined developmental values.

Work on the Sectoral Qualifications Framework for the Mining Sector (SQFM) began in January 2020, in cooperation with the Educational Research Institute in Warsaw. The work was led by a team from AGH University of Science and Technology in Kraków, partnering with *JSW Szkolenie i Górnictwo Sp. z o.o.* [JSW Training and Mining, Ltd.] from Jastrzębie-Zdrój. A conference summarising the results of the work on the SQFM was held on September 18, 2020 at the Pniówek Coal Mine.

Dr. Adam Mirek, President, *Wyższy Urząd Górniczy*
[State Mining Authority] in Katowice

# 1. Introduction

## 1.1. The Sectoral Qualifications Framework as an Element of the Integrated Qualifications System

The creation of the Sectoral Qualifications Framework for the Mining Sector is one of the elements of the overall work to develop and implement the Integrated Qualifications System (IQS) in Poland.

The IQS was established in Poland with the Act of 22 December 2015 on the Integrated Qualifications System[1] (hereinafter, the IQS Act). The purpose of this law was to better adapt the education system to the changing needs of the labour market. The IQS is a significant component of implementing the lifelong learning (LLL) policy in Poland. Its creation fulfils the Recommendation of the European Council on the European Qualifications Framework[2] and is also consistent with the Integrated Skills Strategy, which aims to coordinate public policies at different levels of Polish state administration in this area.

The main idea behind the IQS is an understanding of qualifications as "a set of learning outcomes in the categories of knowledge, skills and social competence, acquired in formal education, non-formal education or through informal learning, in accordance with the requirements set for a given qualification, the achievement of which is assessed through validation and formally confirmed by an authorised awarding body" (art. 2, point 8 of the IQS Act). It is assumed here that a qualification confirms what a person has learned regardless of the manner in which such learning has taken place.

In order to compare different qualifications included in the Integrated Qualifications System, the Polish Qualifications Framework (PQF) was developed. Because it was referenced to the European Qualifications Framework, it is possible to easily compare qualifications awarded in Poland to those awarded in other European countries.

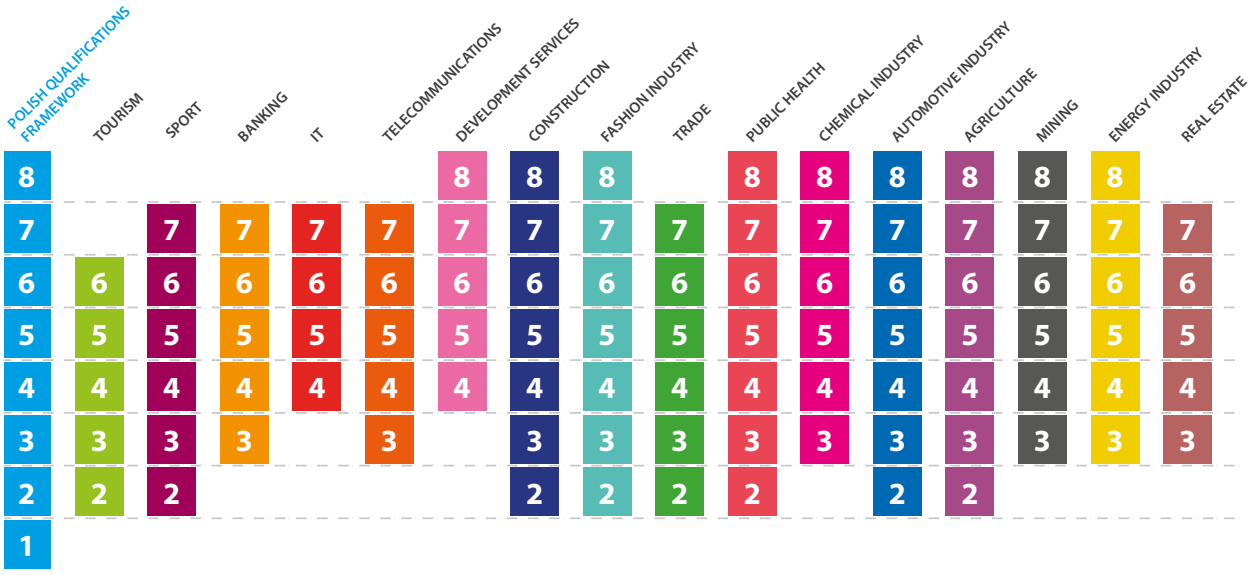
The initial pilot work conducted in 2013–2014 showed that the Polish Qualifications Framework, which is intended as a reference point for all qualifications awarded in Poland, does not always adequately reflect the specific nature of different sectors of the economy. Therefore, work was begun on developing instruments known as sectoral qualifications frameworks, which by adapting to the needs of a given sector, as well as by using its characteristic terminology, can provide a bridge between the world of education and the labour market.

[1] I.e. Journal of Laws of 2020, item 226.

[2] Council Recommendation of 22 May 2017 on the European Qualifications Framework for lifelong learning and repealing the recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning (2017/C 189/03).

To the end of 2020, 16 sectoral qualifications frameworks have been developed in Poland, of which four have been included in the IQS[3]. They are presented in Figure 1.

**Figure 1. Sectoral Qualifications Frameworks**




Source: own work.

The selection of the sectors, for which sectoral qualifications frameworks are developed, is based on several criteria. First of all, those sectors that are strategic for the Polish economy and labour market are supported. This is reflected primarily through their contribution to the gross domestic product and employment, but also through their presence in national strategic documents, such as the Strategy for Responsible Development. Second, the functioning of such tools is more relevant for sectors undergoing rapid technological change, especially relating to automation and robotisation, which lead to changes in the demand for workers' competences. The third criterion, which is often the result of technological changes, entails the occurrence of competence gaps resulting from the mismatch between the educational offer and the needs of employers in the sector. All these criteria are clearly met by the mining sector.

The last criterion, which is also a *sine qua non* for starting work on an SQF, is the demand for such a tool expressed by key stakeholders of the sector. The first signals that such a demand exists were made by sector representatives in the first half of 2018. In June of that year, Dr. Paweł Bogacz, one of the members of the expert team, gave a presentation on the need to develop a sectoral qualifications framework in the mining sector during the conference "A Sectoral Approach to Qualifications – Qualifications Frameworks, Professional Standards, Skills Councils" organised by the Educational Research Institute. The arguments presented

[3] SQFs were developed in the following sectors: sport, tourism, construction, development services, telecommunications, commerce, banking, IT, public health, chemical industry, fashion industry, automotive, agriculture, energy, real estate and mining. The first four have been included in the Integrated Qualifications System, three others received a positive recommendation from the IQS Stakeholders Council and are at an advanced stage of inclusion.

therein contributed to the decision in 2019 to include the mining sector in the work plan for developing sectoral qualifications frameworks.

## 1.2. The Need to Develop the Sectoral Qualifications Framework for the Mining Sector

Mining belongs and in the future may belong to the group of the most important sectors of the Polish economy. This statement has its justification in many aspects. One of them is the level of sales revenues and further profits achieved by the mining industry, which are directly transferred to the added value and impact on the level of Poland's GDP. According to Statistics Poland, the mining industry generated 5.3% of Poland's gross domestic product in 2018. This indicates its great significance for the Polish economy.

To a large extent, the sector shapes its own economic environment, while on the other hand, is strongly dependent on it. With regard to the former issue, it should be especially noted that mining companies constitute the basis for the income of the inhabitants and local government budgets of the regions in which they operate. In this regard, it is worth citing, for example, the results of the June 2020 analysis of Statistics Poland (GUS, 2020), which indicate that the highest average salary registered in Poland in 2019 was held by miners, with a gross level of PLN 8303 per month. Furthermore, the highest average earnings in a city in Poland were found in 2018 in Jastrzębie-Zdrój, while Jaworzno came in third place. Mining also currently guarantees long-term employment to almost 130,000 persons (GUS, 2020) and calculations by economists indicate that an additional five times more people are employed in firms closely cooperating in building the value chain with entities in the mining industry. All these factors lead to the fact that the mining profession is perceived as one of the most prestigious (fourth place in the CBOS ranking, 2019).

Taking into account the budgets of municipalities in Poland, as shown by the research on the "G index", i.e. the budget per capita presented in the samorząd.pap.pl portal for 2018, four mining municipalities were classified among the eight richest municipalities in Poland[4]. To a large extent, these values result from the level of the budget contributions made by the mining industry. The mining contribution index calculated by the International Council of Metals and Mining, which determines the percentage of the value of mining contributions going back to local governments, indicates a value of 53% for Poland, the highest among all European Union countries (ICMM, 2018). On the other hand, as the calculations of the Mining Chamber of Industry and Commerce show, as much as 33% of the revenues of mining companies return to the central budget and local budgets in the form of taxes and other contributions (Olszowski, 2017). Considering the second sphere of economic dependence, relating to the influence of the economic environment on mining companies, the high dependence of mining companies on the

[4] These were Kleszczów, Mielnik, Jerzmanowice and Polkowice, in 1st, 4th, 5th and 8th place, respectively. https://samorzad.pap.pl/kategoria/finanse/nadal-najbogatsi-kleszczow-pozostaje-najbogatsza-gmina-w-polsce

economic situation prevailing in the global markets of mined materials should be noted. This is because, to a large extent, these products are of a standardized quality and shaped globally on the basis of stock exchanges, such as the London Metal Exchange, and these, in turn, operate on the basis of market mechanisms based on the laws of suppy and demand. The very high sensitivity of these two sides of the market to price and non-price determinants results in the occurrence of large changes in the market, arranged in business cycles, the awareness of which is extremely important for miners. It is also important to know that mined materials resource markets are increasingly affected by regulatory costs, mainly relating to the cost of emission allowances and the concept of the circular economy.

The data above comprise the effective business activity of enterprises from three mining industry subsectors: underground mining, open-pit mining and borehole mining. It should be noted that this group includes – in the case of underground mining: KGHM Polska Miedź S.A., Polska Grupa Górnicza S.A., Jastrzębska Spółka Węglowa S.A., LW Bogdanka S.A., Tauron S.A., in the case of open-pit mining: Polska Grupa Energetyczna S.A., and in the case of borehole mining: PGNiG S.A., Lotos S.A. and Orlen S.A. The aforementioned subsectors and enterprises are of strategic importance to Poland, which is evidenced by their capital structure and the fact that they are often national operators in the given field.

Despite the facts noted above, the mining industry is facing a major staff shortage. The number of students studying in vocational schools, secondary schools and colleges in mining majors dropped by 75% between 2008 and 2018. Therefore, in the coming years, the mining industry will be generating a constant demand for new, qualified workers.

The main reason for this state of affairs is the mismatch between the educational system and current mining technologies that have changed in recent years. Both methodologically and in relationship to assessment, the education system has failed to keep up with the systemic changes in the industry aimed at further improving its production and economic efficiency, while at the same time improving employee safety. Every year at least a dozen people apply to study mining, seeking confirmation of their authorisation to work in the industry. Many educational organisations have been established to train future adepts in the art of mining, but they do not always operate in full compliance with the educational system.

This publication contains a description of the Sectoral Qualifications Framework for the Mining Sector (hereinafter SQFM), one of the main results of a project to develop such a tool for this sector in Poland. The project was conducted by a consortium of the Faculty of Mining and Geoengineering of the Stanisław Staszic AGH University of Science and Technology [*Wydział Górnictwa i Geoinżynierii Akademii Górniczo-Hutniczej im. Stanisława Staszica*] in Kraków and JSW Training and Mining Ltd. [*JSW Szkolenie i Górnictwo Sp. z o.o.*]. With the support of the Educational Research Institute (IBE), representatives of the most important industrial and academic entities in Poland associated with the mining sector took part in developing SQFM.

# 2. Constructing the Sectoral Qualifications Framework for the Mining Sector

In accordance with the definition of sectoral qualifications frameworks presented in the Act of 22 December 2015 on the Integrated Qualifications System, the Sectoral Qualifications Framework for the Mining Sector is a description of the levels of qualifications operating in the mining sector. The SQFM levels correspond to the levels of the Polish Qualifications Framework and are an elaboration of selected PQF level descriptors typical of vocational qualifications.

The descriptors of qualification levels in the SQFM further elaborate universal and "vocational" PQF descriptors. They take into account the specific context of the mining sector and further develop the requirements defined in the PQF. They link the language of the PQF (in particular, the learning outcomes) and the terminology typical of the mining sector. Thus they can be seen as a bridge between the industry and the qualifications system, or even as a translation of the PQF into the language of the mining sector.

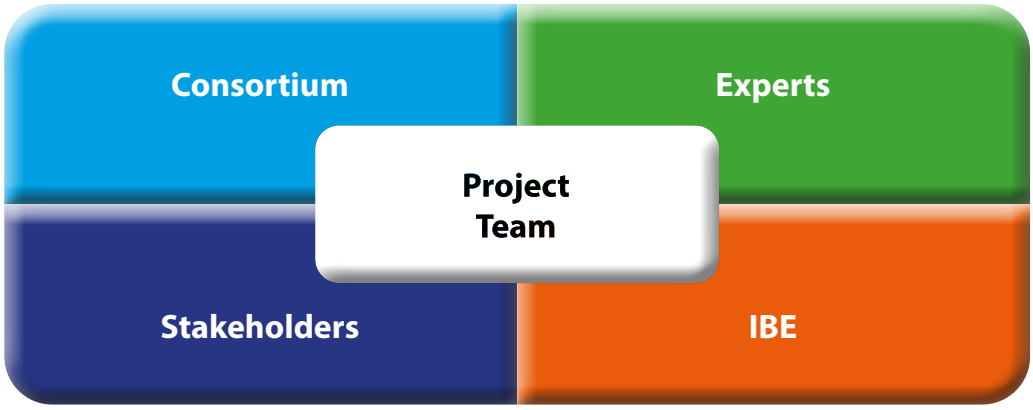
## 2.1. Premises and Aims of SQFM

The process of creating the SQFM had several stages. The actual work on the SQFM was preceded by a survey of competences among the employees of the mining sector, which was conducted by the Educational Research Institute. As part of this study, 60 in-depth interviews were held with employees from different types of mining plants, as well as focus group interviews (FGI), mini-focus group interviews and one expert panel. During these interviews, respondents presented the scope of tasks for each job position, discussed the knowledge, skills, and social competence required to properly perform these tasks, and indicated how they acquired these competences.

The main element of the report created on the basis of the survey was a table presenting the competences required for particular positions in the mining sector. This report was the basis for further work on the SQFM.

The actual work of the SQFM development process began in early 2020. The work was coordinated by a consortium formed by the AGH Department of Mining and Geoengineering and JSW Training and Mining. Within this consortium, a project team was formed to directly implement the tasks, as well as to act as a bridge between the other participants in the project (see Figure 2). Prof. Marek Borowski from AGH University of Science and Technology was appointed project manager.

**Figure 2. Participants in the development of SQFM**




A key activity in the entire process was assembling the expert team to develop the SQFM. The team was composed of people with specialist knowledge of the mining sector (the entities operating in it, the relations between them, competences, the most important qualifications awarded in the sector, etc.), as well as knowledge in the field of qualifications development, education and training programmes for the mining sector in Poland and abroad, basic knowledge of the PQF and the principles of the IQS. Expert team members represented different types of institutions in the sector, including companies from all major types of mining: underground mining, borehole mining and open-pit mining. Table 1 shows the list of team members by sub-team.

The tasks of the SQFM expert team were to:

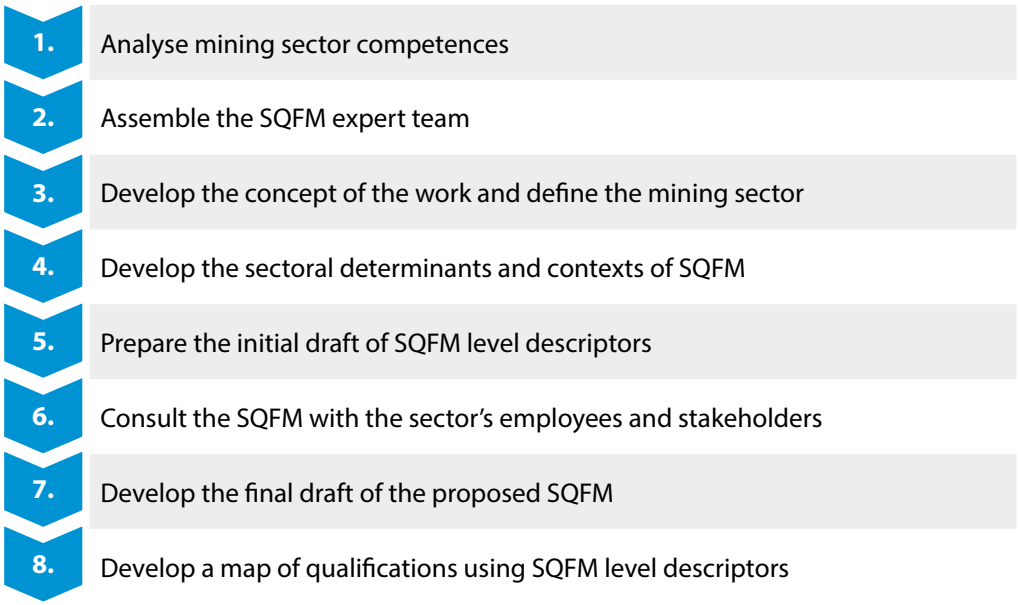
- collaborate content-wise with other team members to guide work and achieve planned objectives,
- assess and monitor the impact of the relationships and links between individual qualifications within SQFM,
- prepare opinions and recommendations relating to project implementation, in particular develop proposals for actions in response to emerging needs and risks (considered potential opportunities),
- develop the initial SQFM draft,
- organise meetings, consultations and surveys aimed at consulting the initial SQFM draft with representatives of dominant and key mining entities and stakeholders,
- develop guidelines for the implementation and use of the SQFM for different stakeholder groups as well as a qualifications map and supporting materials,
- develop the final SQFM draft and prepare the final report.

**Table 1. Sub-teams of experts**

| Team | No. | First name | Last name | Company |
|---|---|---|---|---|
| 1 | 1 | Aneta | Iłenda | Lubelski Węgiel "Bogdanka" [Bogdanka Coal Mine] |
| | 2 | Katarzyna | Lipińska | Górnośląska Izba Przemysłowo-Handlowa [Upper Silesia Chamber of Industry and Commerce] |
| | 3 | Arleta | Chorąży | KGHM Polska Miedź [KGHM] |
| | 4 | Joanna | Ratomska | JSW Szkolenie i Górnictwo [JSW Training and Mining] |
| | 5 | Aneta | Napieraj | Akademia Górniczo-Hutnicza [AGH University of Science and Technology] |
| 2 | 1 | Aleksander | Szymura | JSW KWK "Pniówek" [Pniówek Coal Mine] |
| | 2 | Piotr | Tokarz | Zespół Szkół Technicznych w Rybniku [Complex of Vocational Schools in Rybnik] |
| | 3 | Jacek | Sztyler | Grupa Gumułka – Euroedukacja [Gomułka Group – Euroeducation] |
| | 4 | Aldona | Urbanek | JSW Szkolenie i Górnictwo [JSW Training and Mining] |
| | 5 | Zbigniew | Kuczera | Akademia Górniczo-Hutnicza [AGH University of Science and Technology] |
| 3 | 1 | Alicja | Stefaniak | Wyższy Urząd Górniczy [State Mining Authority] |
| | 2 | Zbigniew | Burtan | Akademia Górniczo-Hutnicza [AGH University of Science and Technology] |
| | 3 | Ryszard | Marszowski | Główny Instytut Górnictwa [Central Mining Institute] |
| | 4 | Sebastian | Napieraj | JSW Innowacje [JSW Innovations] |
| | 5 | Paweł | Bogacz | Akademia Górniczo-Hutnicza [AGH University of Science and Technology] |
| 4 | 1 | Zbigniew | Jagodziński | PGE Górnictwo i Energetyka Konwencjonalna [PGE Mining and Conventional Energy] |
| | 2 | Piotr | Krzemiński | Lafarge |
| | 3 | Łukasz | Machniak | Akademia Górniczo-Hutnicza [AGH University of Science and Technology] |
| | 4 | Marek | Borowski | Akademia Górniczo-Hutnicza [AGH University of Science and Technology] |
| | 5 | Jerzy | Łachmanek | Orlen Upstream |

Figure 3 summarises the tasks and presents the sequence of work on SQFM.

**Figure 3. Stages of work on SQFM**




## 2.2. Definition of the Mining Sector

For the purpose of the study and its main objective – the proposed SQFM – the following definition of the mining sector was adopted as describing the activities undertaken in this sector:

**Mining** – an area of industry comprising all activities aimed at extracting raw materials from the ground and preparing them for use in various branches of industry or for direct use in everyday life.

## 2.3. Sectoral Determinants and Contexts

In order to systematise the work, as well as to give the SQFM project a coherent and logical structure, the first step consisted of distinguishing the sectoral determinants for mining and the context of mining activities. These make it possible to highlight the specific characteristics of the sector, indicate its boundaries, as well as guarantee the completeness of the defined level descriptors.

The following criteria were used to distinguish the sectoral determinants:

1. The determinants, together with the definition of the sector, describe areas of activity that share common characteristics, allowing them to be grouped together as a sector with a clear identity.

2. The sectoral determinants define the key elements building the value realised by human capital in the mining sector, understanding it not only as a value for the recipient of the industry's products, but also for other stakeholders, mainly in the aspect of ensuring occupational safety.

3. The sectoral determinants reflect the geological and mining specificity of the industry and the resulting methods of production, which determine the distinctions (made during the work on the SQFM) of particular subsectors (underground mining, open-pit mining and borehole mining) comprising the mining sector, and also in connection with the time and configuration of the life cycle of a mining project, understood as the place of planning production, opening the deposit, preparing production, mining and closing mining activities.

4. The sectoral determinants reflect the current and future level of technical developments in the sector and the changes occurring within it.

5. The sectoral determinants represent the entirety of the learning outcomes contained in the qualifications of the sector.

6. The sectoral determinants reflect the job descriptions developed in all three subsectors and at all levels, in accordance with the principles of the European Qualifications Framework and the Polish Qualifications Framework.

7. The sectoral determinants make it possible to assess the systematisation, adequacy and completeness of qualification descriptions and job descriptions in all three subsectors.

8. The sectoral determinants are analysed and used together and only in this arrangement are the descriptions of qualifications and job positions assessed.

During the work of developing the sectoral determinants for mining:

- the division of the industry into sub-sectors and the assignment of experts to each sub-sector were confirmed,

- the stages of the life cycle of a mining project in each of the three sub-sectors were distinguished,

- basic processes and functional areas in the mining industry sub-sectors were identified, and

- the types of work performed within each of the separate processes and discrete functional areas in each of the mining industry sub-sectors were distinguished.

According to the definition, mining is a branch of industry comprising all activities aimed at extracting raw materials and preparing them for use in various branches of industry or for direct use in everyday life. The occurrence of raw materials in various states of aggregation, as well as under different geological and mining conditions, makes it possible to extract them using various mining methods, techniques and technologies, which have their own specificity, similar to each other in

certain areas, but differing in their essential part, which also affects the different competences/qualifications indicated for them. In order to fully cover all types of mining activities, and thus the definition of the sector as indicated above, it was acknowledged that for the purpose of constructing SQFM, the sectoral determinants would constitute the three basic methods of extracting raw materials:

- extraction by the underground method,
- extraction by the open-pit method,
- extraction by the borehole method.

## DETERMINANT I – Extraction by the underground method

This determinant consists of the tasks of extracting raw materials located underground and bringing them to the surface using underground mining technologies. Mining technologies used in the underground extraction of hard coal, ores and salt deposits can be divided into:

**I. Basic technologies:**

- opening, the purpose of which is to construct opening-out headings, maintain them in proper condition and modernise them. Opening-out headings connect deposits with the surface. These include shafts, fore-shafts, pit bottoms with adjacent chambers, crosscuts and adits. These headings are usually constructed in gangue with the deposit running across it.
- preparatory, which can be divided into main and secondary. Main preparatory technologies divide the seam into mining fields, level galleries, main ventilation galleries, storied and main inter-level galleries, such as raises, dip-roads and slopes. Secondary preparatory technologies divide the mining fields into excavation fields and inclines, and these in turn into mining pillars. The purpose of these headings is to divide a seam into surfaces enabling its planned extraction.
- mining, including activities aimed at extracting raw materials using the following mining methods:
  - using explosives,
  - using mechanical means,
  - using physical means.

The most frequently used mining method in Poland's hard coal mines is the longwall method, which can be regarded as a mechanical mining method. It consists of:

- wall reinforcement, i.e. construction and reinforcement work aimed at equipping walls with the necessary technical means for the proper mining of a deposit;

- longwall coal mining, i.e. execution of the work of coal cutting, coal haulage and relocating the technical means as required to continue working the mine faces;

- maintenance of longwalls, i.e. performing repair and maintenance work as well as construction and reinforcement work to replace used technical means with new ones in order to maintain the longwall's ability to be mined;

- modernisation of the technical equipment of the longwalls;

- liquidation of longwalls, i.e. performing the processes relating to the cessation of longwall mining.

Ore mines use the room and pillar mining method with explosives. In this method, the body of the deposit is cut into rooms and strips with technological pillars left in place, which as a result of operational pressure are destroyed, signalling a switch into a post-critical operating mode. The pillars separated in this manner work in the mining fields in respect to post-destruction carrying capacity in a similar manner to yielding chock supports. The technological pillars with their appropriately high load capacity allow roof stability to be maintained, while at the same time reduce the development of the direct roof's stratification and its excessive settlement in the working area of the mining fronts. The required supporting capacity of the technological pillars is achieved by appropriately selecting their dimensions and diameters adapted to the local conditions of the ore's deposition and strength properties of the rock mass. The basic varieties of room and pillar mining with roof deflection in the mining of deposits of narrow and medium thicknesses are currently systems that liquidate selected goafs by deflecting the roof on the pillars left in the abandoned workings. Mining methods with hydraulic stowing are used to mine parts of the thicker deposit or in areas requiring surface structures to be protected. Double-layer varieties of room and pillar mining with the liquidation of the goaf by backfilling with hydraulically transported sand are used to mine deposits of over 7 metres thick. The varying strength parameters of the rocks of the mined deposit and the roof result in the extraction of the layers from top to bottom. In this situation, the roof of the preparatory and production workings is located in strong carbonate rocks. The bottom layer is accessed by means of inclined drifts from the floor of the upper layer. Thick deposit mining methods are also highly differentiated due to local geological and mining conditions. Backfilling the goaf positively affects the operation of the residual pillars in the abandoned workings, increasing their supporting capacity and reducing the deformation of the roof, thus the extent of its settlement and impact on the surface.

- mechanical processing of coal and ore, i.e. the set of mechanical, physico-chemical and chemical processes leading to the production of industrial products from solid raw materials as a result of changes in the basic properties of these materials, such as grain size, shape, mineralogical composition, chemical composition, etc.

**II. Auxiliary technologies:**

- transport, which can be divided into main and section transport. Main transport takes place in a mine on the main roads, i.e. between the load spot and shaft.

Section transport takes place within a given section, i.e. between mine faces and the main transport load spot;

- ventilation of headings consists of all issues and activities relating to the supply of sufficient fresh air to active underground mines with its proper distribution and removal of used air, as well as the air conditioning of workplaces;
- draining, i.e. removing (or preventing the inflow of) water in the mine entering the underground headings in order to ensure the safety of mining work;
- environmental protection systems using modern closed loop technologies;
- occupational health and safety and organisational systems used in crisis situations.

## DETERMINANT II – Extraction by the open-pit method

This determinant consists of the tasks of mining useful raw materials deposited underground and extracted using open-pit mining technologies. A characteristic element of open-pit mining is removing an overburden of various thicknesses and composition, as well as mining a raw materials from an open pit (mine workings) and its transport to a destination without the need to create headings characteristic for the underground mining method. This implies the need to transform the elements of the environment and the existing management of the surface located within the open-pit heading, external spoil tips and the required mining infrastructure to extract the raw materials.

Maintaining the infrastructure of this type of mine, in the vast majority of cases, costs less compared to underground mine headings. The operation of an open-pit mining plant is easier due to the much lower risk of natural hazards. Open-pit mines also have more convenient conditions for mechanising the work, as the dimensions of the headings can be adapted to the dimensions of the machines, which, in underground mining, has limited possibilities. Widespread mechanisation, lack of the necessity to protect headings (except for activities performed with the use of basic machines in the mining process), and the smaller scale of natural hazards significantly reduce the number of complex and time-consuming manual tasks requiring various specialisations and appropriate professional qualifications.

The volume of the work performed in mines contributes to the emergence of different divisions of open-pit mining, distinguished by four basic technologies:

1. earthmoving with a high concentration of extraction,
2. earthmoving with a low concentration of extraction,
3. rock extraction,
4. underwater extraction.

Open-pit mining with a high concentration of extraction is primarily associated in the country with lignite mining, which involves removing hundreds of millions of cubic meters of overburden each year, mining tens of millions of tonnes of coal, and in the past, also extracting filling sand for use in underground hard coal mining.

The second technology is primarily the mining of sand and gravel aggregates, industrial sand, fire and ceramic clays, etc. where the machines used are of visibly lower working capacity.

Explosives are mainly used in rock mining technology, primarily to extract hard rocks for the production of crushed-stone aggregates (including products for road engineering), construction stones, aggregates used in cement and lime, plaster and metallurgy industries.

Underwater technology consists mainly of mining natural aggregates and occasionally sands with the use of machines located on land or on the surface of water under the location of the deposit.

The raw materials mined using open-pit technologies are located at various depths. This is particularly important due to the presence of aquifers in different geological layers. The type of mineral and the water table in the area determine whether the mine requires draining in order to conduct dry mining on land, or whether the mineral will be mined directly from below the water table.

## DETERMINANT III – Extraction by borehole mining

This determinant consists of the tasks of discovering, opening, mining and/or modifying a rock mass to extract useful raw materials located underground using boreholes. Boreholes can also be used to search for, identify or extract groundwater[5], as well as geothermal heat that can be obtained and managed. When considering this indicator, borehole mining for the following purposes was not taken into account: geotechnical engineering and geoengineering, rock shooting, rescue operations, geophysical prospecting, drilling for underground (from the surface and underground headings) and open-pit mines, pumping substances into a rock mass, freezing and hydrogeological (non-mining) work. This is because such headings are not made for the purpose of mining raw materials or are made only for supporting this activity.

Due to the final drilling depth, the following boreholes can be distinguished: shallow (made using manual drilling sets or by machine), deep (made using portable or stationary drilling rigs) and very deep (made using stationary drilling rigs). However, taking into account the diameter of the borehole, the drilled headings can be qualified as: small diameter ($Ø < 100$ mm), normal diameter ($100$ mm $< Ø < 500$ mm) and large diameter boreholes ($Ø > 500$ mm).

[5] The Geological and Mining Act (Journal of Laws of 2011, no. 163, item 981) does not treat groundwater as a raw material (with the exception of thermal, medicinal and brine waters).

Boreholes used for geological purposes, research and exploration of solid mineral resources are generally made with small diameter drilling rigs using the core-drilling method to obtain rock samples for analysis. Boreholes for oil drilling are usually normal diameter boreholes drilled using the rotary drilling method with auger bits and holesaws (mainly roller-cone and diamond ones). The rotary method is used to make normal diameter boreholes for mining solid minerals by leaching (e.g. rock salt) or melting (e.g. sulphur).

Due to the trajectory of the borehole axis, vertical and directional, horizontal and diagonal small, normal and large diameter boreholes are drilled. Small and normal diameter boreholes can be used for, e.g. coal seam degasification, underground coal gasification, coring. Large diameter boreholes are drilled as mining, ventilation, drainage and communication shafts (e.g. tunnels, adits, dip-roads). Borehole mining uses normal diameter vertical and directional boreholes to search for, test and study geological structures that are natural traps for liquid raw materials, and then to mine hydrocarbon deposits as well as geothermal, mineral and brine waters. Mined deposits of liquid raw materials, as well as salt caverns, can serve as underground oil and natural gas storage facilities.

The process of drilling a borehole includes a number of cyclical operations, such excavating the borehole, its reinforcement (casing and cementing) and performing borehole tests. The most common drills used in such activities are roller-cone, diamond and cutting drills.

Today, boreholes are being made with different axis trajectories. The following borehole axis trajectories are distinguished:

- vertical, the most commonly used,
- diagonal, used in, e.g. underground mining,
- guided boring, used in geoengineering,
- directional:

  a) J-shaped, e.g. gas or oil,

  b) S-shaped, e.g. in geothermal energy,

  c) horizontal, e.g. in underground gas storage facilities,

  d) multilateral drilling, used mainly in drilling from offshore platforms,

  e) perfectly vertical, e.g. freezing.

Relatively new solutions include technologies using coiled tubing drilling. This solution allows boreholes to be achieved with a very high intensity of spatial inclination (small radii of inclination).

Another solution used for vertical and directional drilling is to keep the hydrostatic pressure of the drilling mud below the static pressure of the formation being drilled (underbalanced drilling).

The drilling fluid used to lift the drill cuttings to the surface can be liquid, foam, nitrogen, mist, natural gas or oil (flow drilling), or air. The various drilling mud technologies used have the following advantages:

- increasing drilling speed,
- extending the lifespan of drilling tools,
- reducing drilling mud losses,
- minimising permeability damage to the near-borehole zone,
- achieving a higher yield of reservoir fluid,
- extending the use of a borehole intended for mining,
- reducing investment costs.

Extracting geothermal heat can be obtained by drilling a heading and installing a pipe system to exchange heat with a rock mass through the circulation of a heating medium. Extracting geothermal heat using borehole heat exchangers is a specific type of extraction. In this case, instead of matter, heat is the object of exploitation (in contrast to geothermal boreholes where first, thermal water is exploited, then used to transport thermal energy to the surface).

Borehole headings can be made using the following methods (drilling methods):

- rotary method (most commonly used) in which an auger bit rotating at the bottom of the hole is curing a rock by crushing, cutting, crumbling or grinding. This method includes different ways of drilling:

  a) spindle drilling (allows diagonal or vertical upward drilling from underground mines),

  a) table drilling (a drilling table on the surface provides rotary motion to the drilling pipe ending in an auger bit at the bottom of the borehole),

  a) drilling with a downhole motor (on a fixed pipe, with a hydraulic motor driven by drilling mud, located above an auger, which provides the auger bit with rotary motion),

  a) drilling with a side or peak motor (a motor drives a cable and along with it moves downwards as the drilling progresses, allowing the cable to be rotated during lifting operations);

- the rotary-hammer method in which an auger hammers while rotating the auger bit through a special mechanism called a "down the hole" hammer that is located directly above the auger (there are also hammers installed on the drill pipe at the surface, in such a case the rotating pipe transfers the impact to the auger bit);

- the hammer method in which the auger bit hammers rock causing it to be crushed and crumbled. Next, the output is brought to the surface using a shell bit;

- the manual method, in which an earth auger bit, by cutting, bores inside the surface of poorly compacted rocks. The excavated material is then pulled to the surface on the coils of the auger bit.

The following contexts were established for the determinants presented above:

**Context I – Conceptual work to study the feasibility of a mining investment and design work to implement a mining investment**

Context I for the SQFM determinants consists of tasks to perform the technical assessment of a project's feasibility in relation to the end results – extraction level, product quality, the environmental impact of the operation, operating costs, and capital expenditures. At this stage, a multi-variant concept of the mining plant is usually developed, taking into account the main components of the production line. The basic parameters of the plan established at this stage, such as production volume, productivity, mining systems, deposit extraction coefficient, basic costs as well as the projected environmental impact of the operation, are developed to support the investor's decision to obtain a decision on the environmental conditions of project implementation, and at a later stage, to obtain the concession for mining raw materials from the deposit. The results of the conceptual work at this stage are also used to develop the Deposit Development Plan as an appendix to the concession application.

Within this determinant context, tasks consisting of preparing detailed technical plans for the investment after obtaining the concession for mining the deposit are also performed. Details are provided for the general concept to the point where it is possible to construct the infrastructure needed to operate the mining plant. A schedule of the work and expenditures for constructing the plant and for the mining and production work are developed. The characteristic work of this determinant also includes preparing the investment to expand an existing, functioning mining plant or restart the operations of a periodically inactive one.

**Context II – Mining operations (preparation work, opening a deposit, mining and maintaining the operation of the mining plant)**

Context II consists of tasks to prepare investments on the premises of a mining plant, as well as to prepare headings, elements of headings and opening holes. The characteristic work of this determinant also includes implementing

an investment to expand an existing, functioning mining plant or restart the operations of a periodically inactive one.

In addition, this context includes the tasks of preparing a heading face or hole and performing the basic activities of a mining plant, which is mining a raw material and then preparing it for use in various fields of industry. This work gradually depletes the documented deposits using various methods and technologies. The production process takes into account all aspects of maintaining the operation in accordance with the mining plant's operation plan and applicable industry regulations. During mining, other work relating technologically and organisationally to the mining of the raw material is also conducted, which is required in order to obtain the concession.

**Context III – Work relating to decommissioning a mining plant and post-mining reclamation.**

Context III consists of tasks to prepare for and decommission part or all of a mining plant. The work is conducted in accordance with the operation plan of the mining plant being decommissioned or the operation plan of part of the mining plant being decommissioned or the applicable industry regulations. The aim of the work is to decommission the resources of machinery and equipment, which can be subsequently commercialised, and to gradually decommission the headings. The work is conducted in a manner enabling the maximum possible post-mining reclamation in accordance with issued administrative decisions.

## 2.4. SQFM Level Descriptors

The level descriptors of qualifications are the most important component of the Sectoral Qualifications Framework for the Mining Sector. The expert team began working on them immediately after designating the scope of the sector and defining the sectoral determinants and contexts of activities. The basis for defining the descriptors were the results of the previously discussed research on the mining sector's competences, which was critically analysed, as well as their appropriate generalisation and supplementation. The following premises were adopted:

- The SQFM level descriptors fully correspond with the premises of the Polish Qualifications Framework, which means that they are presented as learning outcomes and reflect the progress achieved by a learner. They show how knowledge, skills and social competence increase as the result of learning in various contexts and at various stages of life;
- The SQFM level descriptors are based on second stage PQF level descriptors typical for qualifications attained in vocational education and training;
- They take into account the specificity of the mining sector and use its typical terminology;

- They include descriptors for levels 3 to 8, which were determined to be adequate for the specific characteristics of the sector.

The full set of SQFM level descriptors is presented in Annex.

# 3. Researching the Opinions of the Sector's Stakeholders on SQFM

After the initial SQFM draft was developed, the consultation process began. For this purpose, a broad study was conducted among employees of the sector and other stakeholders. This chapter describes the process and results of the research.

## 3.1. Aim of the Study and Issues Investigated

The main objective of this study was to identify the opinions and attitudes of mining sector stakeholders towards the proposed SQFM being developed. People working in mining plants as well as in other companies and entities associated with the mining sector were invited to participate in this study. Data from the study were anonymised.

The study methodology assumed conveying the proposed draft of the SQFM to the respondents in the form of a separate document. The expected result of the conducted study was to collect material that would allow the provisions of the proposed SQFM to be checked in terms of employers' needs and expectations regarding the qualifications of employees and to assess the validity of the proposed solutions.

In particular, the study analysed the following general research issues:

1. Assessment of the competences, qualifications, and level of knowledge of mining sector employees,
2. Assessment of knowledge about the Polish Qualifications Framework – especially the Sectoral Qualifications Framework for the Mining Sector,
3. Assessment of the extent to which the draft SQFM is understandable,
4. Assessment of the effectiveness of the draft SQFM for the mining sector.

## 3.2. Research Methods, Techniques and Tools

The research design assumed the use of quantitative and qualitative methods. This allowed the data to be triangulated – to look at the analysed research problems from various perspectives to obtain empirical material that would allow the addressed problems to be analysed from different points of view.

The quantitative method was based on using the Internet survey technique. The tool used in this part of the study was an online survey placed on the www.

ebadania.pl platform. The final number of completed questionnaires and the complexity of the tool (the large number of cafeteria alternatives in the closed-ended questions) made it impossible to perform meaningful correlation analyses (verification of the impact of independent variables on the dependent variables). The cross-tabulation analysis, however, does not indicate the existence of associations between the respondents' gender, length of employment in the mining sector and declared places of employment with the analysed research problems. The qualitative method was based on using the in-depth interview technique.

The construction of the tools was the result of discussions and consultations held among the experts. The tools were verified in a pilot study conducted on a sample of respondents with diverse socio-demographic and professional characteristics relevant to the research problem.

### 3.2.1. Selection of the Study Sample and the Characteristics of the Studied Population

The study applied a purposive sampling of the respondents. The main criterion for inclusion in the sample was employment in the mining sector. People working in various entities and institutions associated with the mining industry were invited to take part in the quantitative research. Respondents with particularly broad and deep knowledge of the issues in question were invited to take part in the qualitative research – primarily due to the specificity of their professional duties and positions held (hereinafter referred to as experts).

The selection of specific individuals invited to participate in the study was the result of expert consultations among the project team.

The research was conducted from May to July 2020. The main research activities were preceded by a pilot study, which allowed for the final development of the research concept, the design of the tools and the directions of data analysis. Due to the limitations resulting from the pandemic caused by the spread of the SARS-COV-2 virus, the empirical material was collected exclusively online.

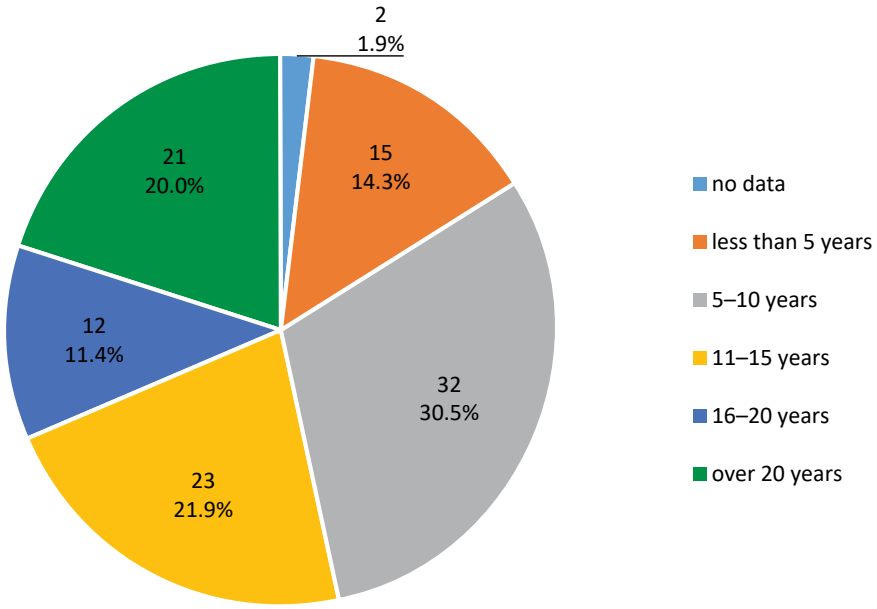
The respondents did not comment on the implementation of the study (occasionally there were comments on the excessive development of the research tools and wording of the questions). Their involvement in the project should be assessed as high. This is evidenced by the numerous responses to the open-ended questions in the questionnaire and the extensive answers to questions asked during the unstructured interviews.

Part of the results of the quantitative research were prepared on the basis of responses from 105 participants.

The number of years respondents had worked in the mining sector was quite varied. Less than one-third of the respondents declared that they had been working in this sector for 5 to 10 years, and every fifth respondent stated that their length of service was between 11 and 15 years; a similarly large category of respondents spoke of their experience of more than 20 years working in the mining sector. Less

numerous were the categories indicating work tenure in the industry for less than 5 years (14.3%) and 16–20 years (11.4%). Detailed data are presented in Figure 4.

**Figure 4. Length of work in the mining sector – experts**




Source: own research and analysis, N=105.

Two-thirds of the respondents were persons employed directly by a mining company (mine). Also among the respondents was a large representation of persons working in a company or entity associated with the mining industry other than a mining company. Detailed data is presented in Table 2.

**Table 2. Place of employment in the mining sector**

| | |
|---|---|
| Mining plant (mine) | 60% |
| Other company/entity connected with the mining sector | 40% |

Source: own research and analysis, N=105.

Respondents were also asked about membership or work in various types of institutions associated with the mining industry. The data in Table 3 show that almost half of the respondents declared membership or work in mining sector institutions/organisations/associations. Respondents much less frequently declared employment or membership in institutions performing supervisory and regulatory functions, activity in employers' organisations and associations, or work in universities and research institutes. The least frequent responses indicated employment or membership in entities associated with the mining sector in areas other than those indicated in the cafeteria of selections.

**Table 3. Professional activity in the mining sector**

| | |
|---|---|
| Employment/membership – sectoral institutions/organisations/associations affiliated with the mining sector | 43.8% |
| Employment/membership – organisations and associations of employers | 6.7% |
| Employment/membership – supervisory or regulatory institutions | 8.6% |
| Employment/membership – higher education institutions or research institutes | 6.7% |
| Employment/membership – other entities associated with the mining sector | 2.9% |

Source: own research and analysis, N=105.

A total of 20 respondents took part in the qualitative research. These were people who, due to the specifics of their functioning in the mining sector (place of employment, position held and/or length of service), have above-average knowledge of the functioning of this sector. In particular, they have a good understanding of the problems, needs and expectations of the people employed in this sector and are familiar with the specific institutional, organisational, structural and economic solutions existing in mining enterprises.

The group of experts included 4 women and 16 men. The length of service in the mining sector declared by the respondents varied. As indicated by the data summarised in Table 4, the most numerous were experts declaring employment in the sector for over 20 years. The respondents also included persons with relatively short work experience in the sector – less than 5 years.

**Table 4. Length of work in the mining sector – experts**

| | |
|---|---|
| under 5 years | 5 |
| 5–10 years | 2 |
| 11–15 years | 5 |
| 16–20 years | 1 |
| over 20 years | 7 |
| Total | 20 |

Source: own research and analysis.

Most of the surveyed experts were employed in companies and entities associated with the mining sector. Table 5 presents the declared places of employment (several experts declared simultaneous employment in both types of entities listed – hence the number of indications does not equal the number of respondents).

**Table 5. Place of employment in the mining sector – experts**

| | |
|---|---|
| Mining plant (mine) | 6 |
| Other company/entity associated with the mining sector | 16 |

Source: own research and analysis.

The experts were also asked about membership or work in various types of institutions associated with the mining industry. The data in Table 6 indicate that the largest number of respondents declare membership or work in institutions/organisations/associations affiliated with the mining sector. None of the experts, however, declared activity in employers' organisations or associations.

**Table 6. Professional activity in the mining sector**

| | |
|---|---|
| Employment/membership – sectoral institutions/organisations/associations affiliated with the mining sector | 12 |
| Employment/membership – organisations and associations of employers | 0 |
| Employment/membership – supervisory or regulatory institutions | 2 |
| Employment/membership – higher education institutions or research institutes | 5 |
| Employment/membership – other entities associated with the mining sector | 5 |

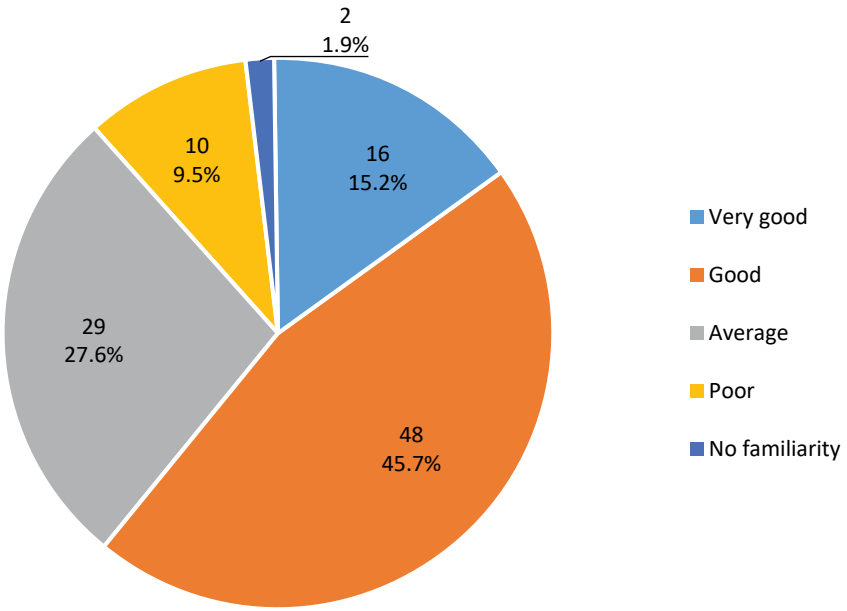
## 3.3. Results of the Consultations

### 3.3.1. Familiarity with the PQF and SQF

The starting point for the analysis of the data collected during the empirical research was the overall assessment of the degree of familiarity with the PQF. The data presented in Figure 5 shows that only 1.9% of the respondents declared that they had no familiarity with this concept. The vast majority of respondents claimed that they are familiar with the PQF concept – having good (45.7% of responses) or very good familiarity (15.2% of responses).

A fundamental issue in the project was also the perceived need for a document regulating the qualifications framework in the mining sector. Conclusions and findings on this matter were formulated on the basis of statements from the experts invited to take part in the study. The most characteristic statements of respondents from this group, cited below, indicate a commonly held belief in the legitimacy of introducing a document to regulate the qualifications framework and the justification for this.

**Figure 5. Assessment of the level of familiarity with the concept of the Polish Qualifications Framework**




Source: own research and analysis, N=105.

> SQFM will provide employers with a new, more accurate tool for assessing employees' knowledge, skills and qualifications and the areas that need improvement or require further employee development. Currently, this improvement or development occurs intuitively or superficially and does not fully meet its objectives. With the creation of the SQFM, the employer will be equipped with a tool, thanks to which he will also be able to better assess candidates for new employees, in accordance with the framework.

Another respondent states that such a document in the mining sector is an innovative solution that would allow the relevant qualifications in the industry to be systematised and new career paths, innovative training methods and technologies to be created for employees. This document would support the planning of personal development, as well as provide the opportunity to assess the value of the diplomas or certificates attained in the mining sector.

The next respondent stated that the document would provide a kind of foundation for developing/implementing training in response to the needs of the mining sector/industry. It would help to present one's qualifications to an employer in a transparent manner and facilitate the confirmation of knowledge, professional skills and competences.

> The creation of a document regulating the qualifications framework in the mining sector is needed to systematise the scope of the topics being taught in the various professions of the mining sector. This document should ensure a uniform system of teaching (training) and attaining professional qualifications and competences.

The respondent notes that there is a need to produce a document regulating the qualifications framework due to the harmonisation of the level of teaching in a given sector in European Union countries.

> In a dynamically changing labour market it is necessary to systematise one's qualifications, which is important in terms of the international aspect and competitiveness in employment. The mining sector consists of a multitude of occupations and therefore a multitude of different types of diplomas and certificates, often making it impossible to use them as the basis for determining the level of a qualification and to compare them to qualifications nationally or internationally, particularly when recruiting staff.

> Mining (in particular underground mining) is a very specific industry. It requires continuous professional development due to constantly changing geological and mining conditions. These ever-changing underground conditions require employees to undergo continuous learning. The management staff of mines are subject to constantly changing social, environmental and organisational expectations, as well as the ongoing restructuring of mines.

> All this requires the development, through an appropriate teaching system, of a common language applicable not only in our country, but also for the whole EU.

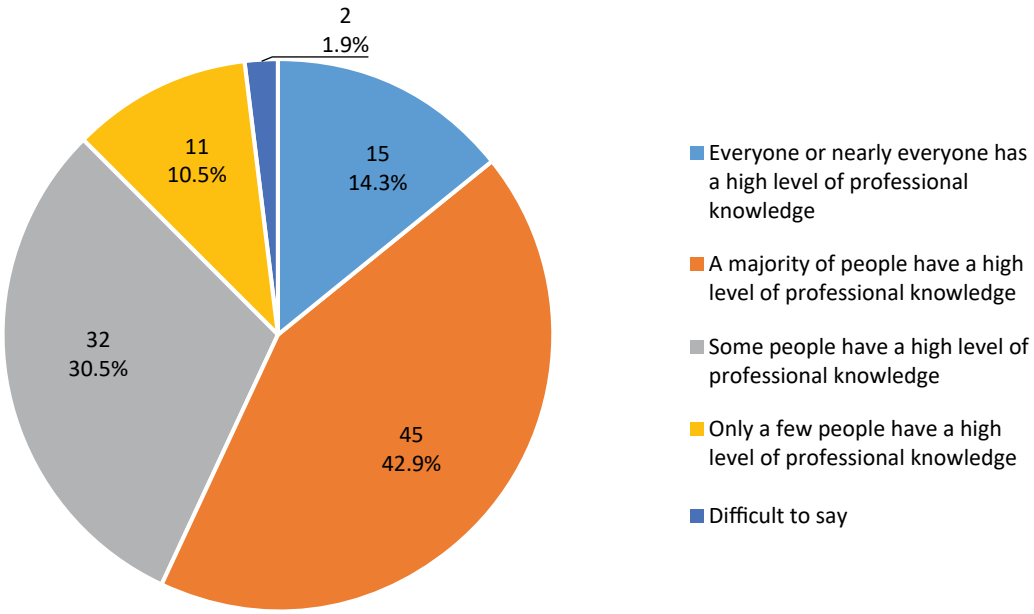
> The need to produce a document regulating the qualifications framework for the mining sector exists and stems from the necessity to systematise the process of confirming possessed skills, knowledge and competences. Developing a qualifications framework for the mining sector will allow a more objective comparison of candidates for a given job position. In an era of the increasing retraining of employees throughout their careers, the framework can be a key reference to make the right choice of job candidate. The sectoral qualifications framework document may make it possible to indirectly increase the competitiveness of the mining industry.

### 3.3.2. Assessment of the Level of Current Knowledge and Competences of Mining Sector Employees

**NON-MANAGEMENT EMPLOYEES**

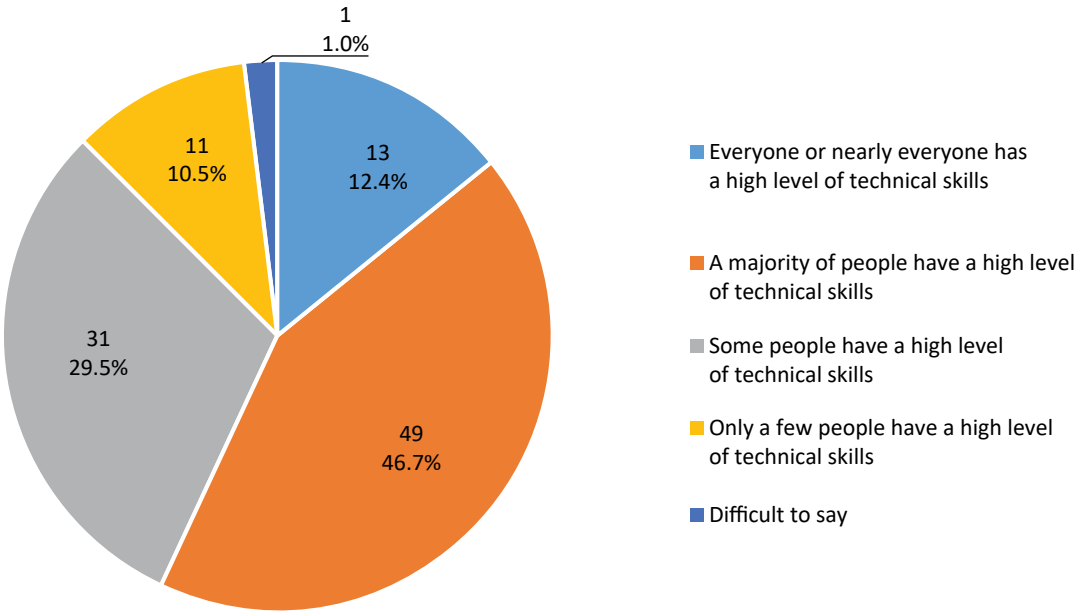
The next issue analysed was the overall assessment of selected aspects of the qualifications of non-management employees in mining sector companies, i.e. with regard to professional knowledge, technical skills and social competence. Detailed data are presented in Figures 6, 7 and 8.

**Figure 6. Assessment of the qualifications of non-management employees in mining sector companies in relationship to professional knowledge**



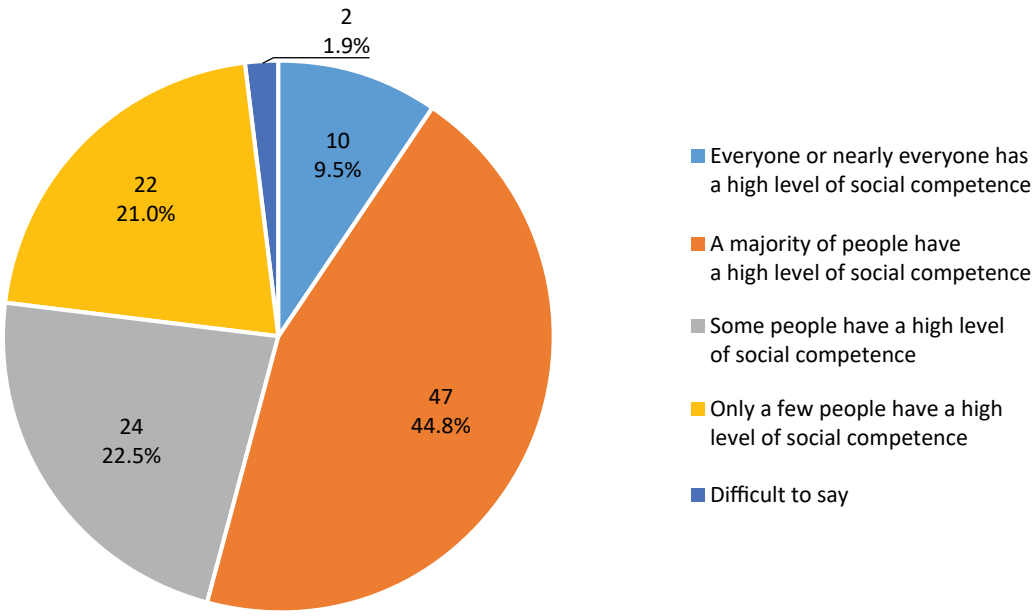

Source: own research and analysis, N=105.

**Figure 7. Assessment of the qualifications of non-management employees in mining sector companies in relationship to technical skills**




Source: own research and analysis, N=105.

**Figure 8. Assessment of the qualifications of non-management employees in mining sector companies in relationship to social competence**




Source: own research and analysis, N=105.

The data presented above indicate high ratings for competence and knowledge in the dimensions listed. Respondents were most often of the opinion that the majority of employees in non-managerial positions in mining enterprises have a high level of competence and knowledge. With respect to the aforementioned assessed issues (professional knowledge, technical skills and social competence), the percentage of respondents stating that the vast majority of this group of employees – almost all or even all employees – are well prepared to perform their professional functions exceeded 50%. Respondents were most critical of social competence – 21% of those asked stated that only a few non-managerial employees have a high level of skills in this area, and 22.9% said that only some of these employees are characterised by a high level of social competence.

Respondents who had doubts about the level of competence of non-managerial mining employees in the assessed aspects were asked to indicate the main deficits perceived in each area. The analysis of these statements supplementing their assessments indicates the existence of several major problems within each of the evaluated categories. A synthesis summarising the unstructured statements is presented below.

I. Deficits indicated in the area of professional knowledge:

- lack of workers' practical experience,
- inadequate knowledge of the duties involved in performing a given job,
- lack of basic knowledge about mining,

- excessive concentration of workers on theory (often disconnected from professional practice)
- deficiencies in specific aspects of knowledge (e.g. mechanics, hydraulics, electronics, automation, pneumatics, OHS principles, etc.)
- lack of responsibility for entrusted equipment,
- inadequate education,
- personality characteristics (e.g. laziness, unjustified belief in own high level of expertise).

II. Deficits indicated in the area of technical skills:

- lack of workers' practical experience,
- low number of training courses attended,
- lack of interest in upgrading qualifications,
- shortages of specific skills (e.g. electrical engineering, mechanical engineering),
- lack of manual skills,
- violation of occupational health and safety rules,
- excessive concentration of employees on theory (often detached from professional practice – as above),
- lack of specialised education,
- lack of reflection concerning the consequences of actions taken.

III. Deficits indicated in the area of social competence:

- lack of ability to work in a team,
- deficiencies in effective communication (conveying information),
- shortcomings in terms of personal culture,
- lack of empathy,
- lack of team management skills,
- assuming the attitude of being entitled to everything.

The conclusions based on the quantitative material were supplemented by findings from the analysis of the unstructured interviews. The statements of the social

experts also indicate a quite high assessment of qualifications, competences and knowledge. At the same time, they signal the existence of certain deficits (sometimes they are categorically formulated) – especially in the area of the social competence of non-managerial mining employees, but not only. This is evidenced by the most characteristic statements of the experts cited below.

"A fairly high level of qualification is found among employees in the mining division – mainly as a result of the low complexity of the work. In the case of employees in the electrical and engineering divisions, the situation is more difficult due to the greater extent of technical knowledge that employees must have. There is a lack of training in social skills for lower-level manual and supervisory workers and for lower-level clerical workers.

"I consider the current qualifications of the non-managerial staff to be qualitatively satisfactory. (...) Young workers show above all a lack of knowledge of the practical meaning of the theoretical knowledge they have acquired. They also do not fully understand their role in the organisation. Employees with medium seniority do not have significant deficiencies. Employees with long seniority do not show initiative in implementing new solutions, and if they do, they do not fully keep up with new technologies.

"The qualifications of workers not holding managerial positions in mining sector companies have poor technical skills – some activities are complicated and, despite his/her qualifications, the worker is not able to perform them independently or the activities performed are of poor quality.

"I consider the qualifications of non-management employees to be satisfactory, with particular emphasis on practical training. I believe that there is still not enough practical teaching, gaining experience. For example, extramural schools/universities that dramatically exclude proper practicums, which results in the trainee not being able to translate his/her knowledge and practical skills into his/her work.

"As far as theoretical education and dealing with social situations are concerned, I have no comments and assess them to be at a high level.

"The qualifications of the workers are, in my opinion, at a good level, with the proviso that these are qualifications obtained after additional courses and training for particular job positions, and not after graduating from a trade school. I believe that such courses and training are an essential factor in the quality of employees' skills.

"I consider the qualifications of the workforce to be good, but there is a noticeable lack of work experience, particularly among young workers. Looking at the mining sector in general, one can see that there are many young workers with no experience and many experienced workers who will be retiring soon.

"I see two deficits: a deficit of practical skills, manual skills, logical professional thinking, anticipating the consequences of actions and activities, and a deficit

of psychosocial skills, such as communication, the ability to work in a team, understanding instructions, providing feedback, dealing with stress.

"Among the qualification deficits that I see in current non-managerial mining sector employees, I can mention: the lack or low level of practical experience in areas of possessed specialist knowledge. A low level of social competence is also noticeable among the younger generation, probably resulting from the spread of digital communication. I often see that this group possesses narrow specialisation and a lack of understanding of the problems of the department, the company in a broader context, as well as the lack of taking into account knowledge from other fields.

"The qualifications of non-managerial mining company employees are insufficient in terms of professional knowledge or technical skills, and these employees are often not familiar with health and safety regulations, the instructions for the jobs they hold, or labour law. They are often unable to perform their work under time pressure or in their working conditions (underground work).

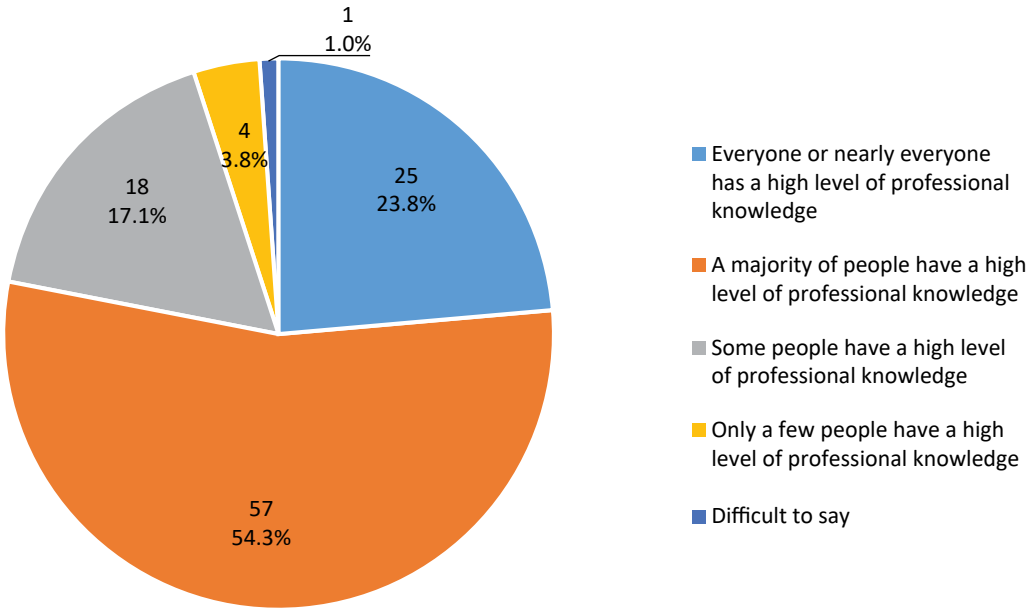
"We rate the competence of non-managerial employees very highly. In addition to our own day-to-day observations, this is reflected in the long-standing and persistent phenomenon of the outflow of professionals to work abroad. New working conditions require rapid adaptation to new requirements, different management methods, language skills – which only confirms the high qualifications of such employees.

**MANAGEMENT STAFF**

Similarly to non-management employees, respondents were asked to assess managers in selected aspects, i.e.: professional knowledge, technical skills, social competence, knowledge of economics, organisation and management, and occupational safety. Detailed data are presented in Figures 9–14.

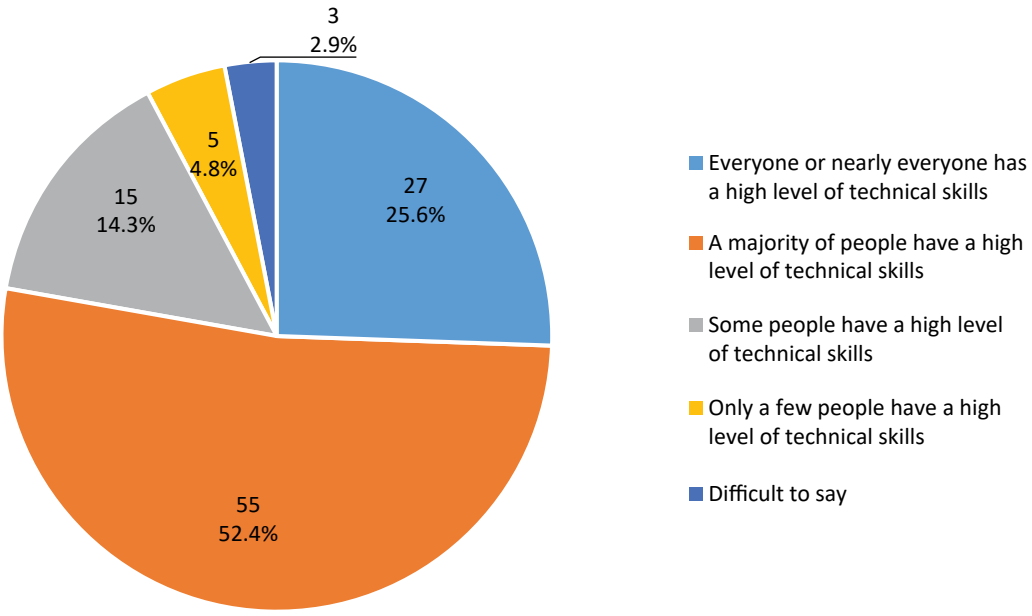
The data presented in the figures clearly indicate that the management staff of mining enterprises is highly assessed by the respondents in all analysed areas. Between one-quarter to one-fifth of the total number of respondents stated that all or almost all the members of the management staff are characterised by a high level of all examined aspects: professional knowledge, technical skills, social competences, economic knowledge, organisational and management competences and occupational safety qualifications. The dominant answer given by respondents was that most members of the management staff had high competences and level of knowledge in all the assessed areas (such opinions were formulated by approx. half of the respondents). The issue of social competence was rated relatively the lowest. One-fourth of the respondents believe that some management staff are characterised by high abilities in this respect, but one-tenth of the respondents stated that only a few can be characterised by a high level of social competence. On the other hand, the level of professional knowledge, technical skills and qualifications in the area of occupational safety were rated highest. Respondents who had doubts about the level of competence of managerial mining employees in the assessed aspects were asked to indicate the main deficits perceived in each area.

**Figure 9. Assessment of the qualifications of management staff in mining companies in relationship to professional knowledge**



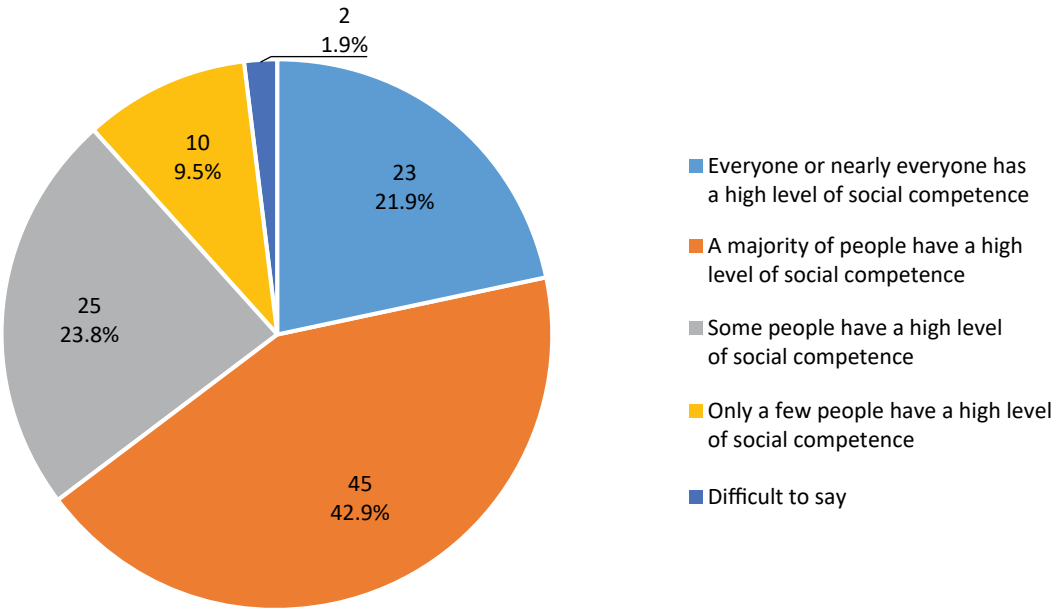

Source: own research and analysis, N=105.

**Figure 10. Assessment of the qualifications of management staff in mining companies in relationship to technical skills**



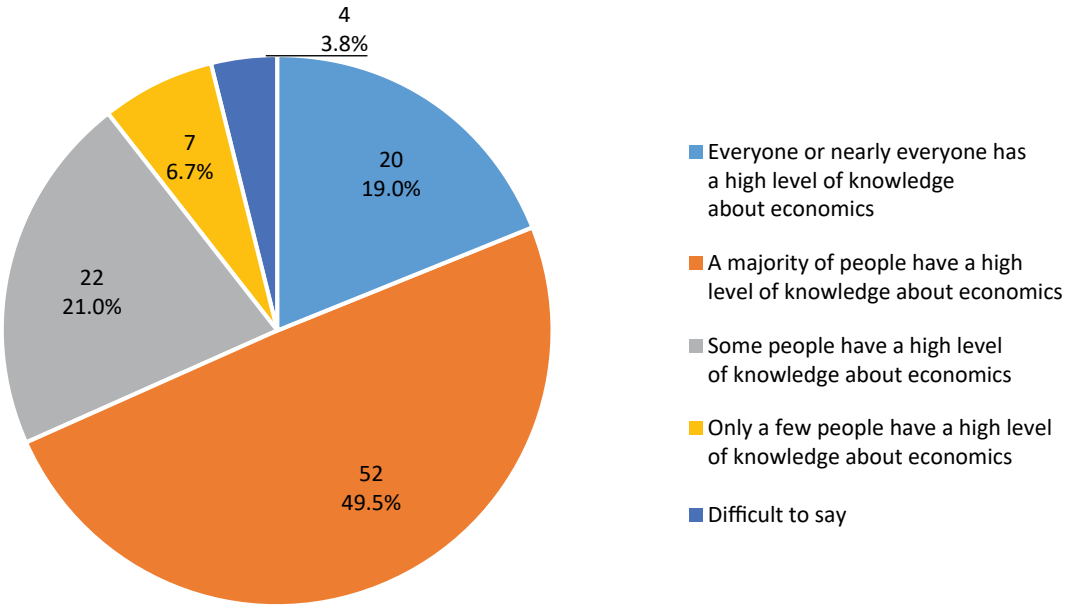

Source: own research and analysis, N=105.

**Figure 11. Assessment of the qualifications of management staff in mining companies in relationship to social competence**



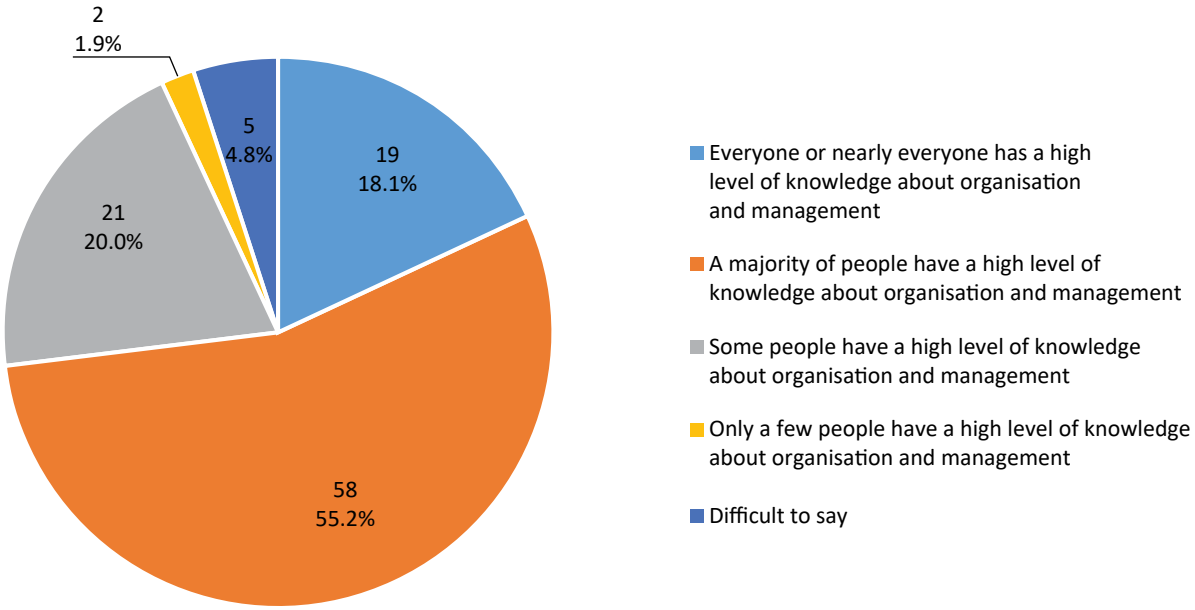

Source: own research and analysis, N=105.

**Figure 12. Assessment of the qualifications of management staff in mining companies in relationship to knowledge about economics**



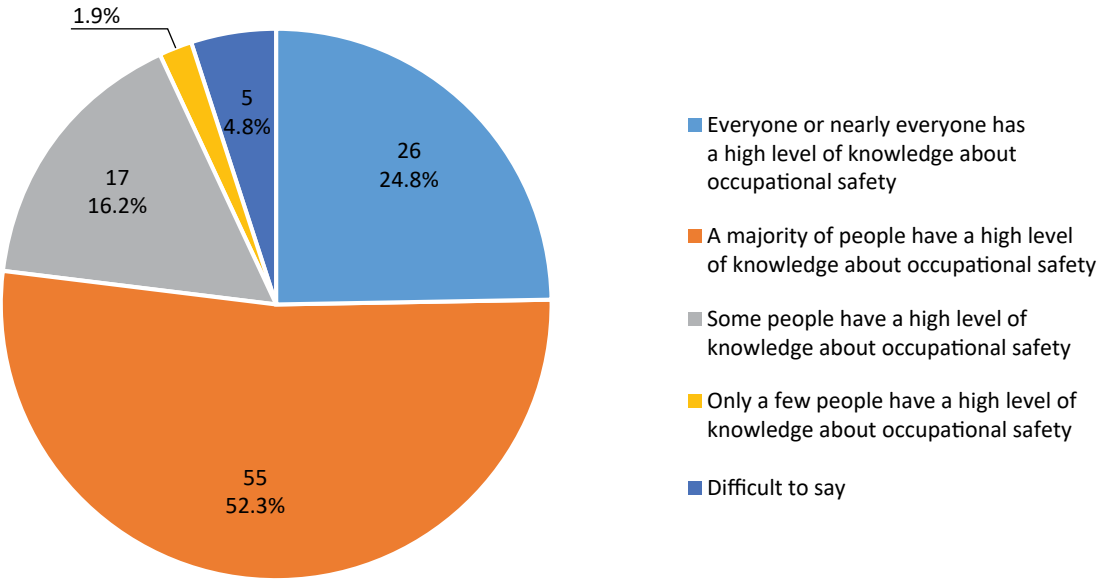

Source: own research and analysis, N=105.

**Figure 13. Assessment of the qualifications of the management staff in mining companies in relationship to organisation and management**




Source: own research and analysis, N=105.

**Figure 14. Assessment of the qualifications of management staff in mining companies in relationship to occupational safety**




Source: own research and analysis, N=105.

The analysis of the respondents' statements supplementing their declarations in the assessment indicates the existence of several fundamental problems within each of the aspects reviewed. A synthetic summary of the unstructured statements of those interviewed is presented below.

I. Deficits indicated in the area of professional knowledge:
   - lack of experience,
   - lack of participation in training,
   - inadequate education,
   - inadequate technical, organisational and legal preparation.

II. Deficits indicated in the area of technical skills:
   - lack of experience,
   - lack of participation in training,
   - inadequate education,
   - reluctance to implement innovative technical solutions.

III. Deficits indicated in the area of social competence:
   - inadequate educational background,
   - inability to lead a team,
   - lack of empathy,
   - inability to cope with stress,
   - lack of knowledge about modern concepts of human resources management,
   - lack of communication skills.

IV. Deficits indicated in the area of knowledge about economics:
   - a lack of basic and detailed knowledge about economics,
   - inability to calculate profits and costs,
   - lack of experience,
   - inability to make economic decisions,
   - wastage of equipment and material,
   - inadequate knowledge of the functioning of a mining enterprise.

V. Deficits indicated in the area of organisation and management:

- lack of experience,
- inability to manage a team,
- lack of knowledge about modern concepts of human resources management,
- lack of long-term planning skills,
- inadequate education.

VI. Deficits indicated in the area of occupational safety:

- lack of experience,
- focus on profits at the expense of safety procedures,
- disregard for risks,
- abuse of occupational health and safety procedures,
- poor knowledge of occupational health and safety principles.

The presented statements of the respondents indicate the deficits they perceive both in the non-managerial group of employees working in the mining sector as well as among the management staff. The most frequently occurring themes expressed by the respondents were: lack of experience, lack of appropriate education in a given field, and organisational and communication deficits.

As in the case of non-managerial employees, the conclusions from the quantitative material on the qualifications, competences and knowledge of the managerial staff in the specified areas are supplemented by the findings from analysing the statements of experts participating in the unstructured interviews. Their comments indicate a high assessment of the analysed aspects, but at the same time, point to the existence of certain deficits – especially in the area of social competence. This is reflected by the most characteristic statements of the experts quoted below.

> "In most cases, those who hold positions in mine management are engineers. For this reason, their competence in the field of technical knowledge and skills should be assessed quite highly. Building competences in the field of economics, management and organisational expertise requires work. Knowledge in these areas is in many cases based on fragmentary information acquired in the course of work and through one's own intuition. An effort should be made to define the necessary economic, managerial and organisational knowledge for each job (job group) and on this basis, to implement training systems or other opportunities to acquire competences.

> "The occupational health and safety qualifications for the whole company are sanctioned by the scope of required OHS training and, for mobile positions, also by the

requirement to constantly control both the job positions and employees' knowledge. This requirement makes it necessary for both those being inspected as well as those performing the inspections (and not the OHS services) to regularly demonstrate their knowledge of safety in the execution of their work.

" Overall, I consider the qualifications of the management staff to be satisfactory and acceptable.

" As far as the qualifications of management are concerned, I consider them to be very good. I think that universities educating such staff, i.e. AGH University of Science and Technology and the Silesian University of Technology prepare these persons well to work on managerial levels. Nevertheless, I would also put emphasis here on the practical aspect of gaining experience, but I do not have any major comments.

" I rate the knowledge on economics and safety at a high level. This aspect is widely discussed, understood and applied.

" I assess the qualifications of employees as good. I think that an important element is to refer the management staff to additional training on improving competences in the areas of human resources management, communication, resolving conflicts in a team, etc.

" The deficit of expertise among the management staff of mining enterprises significantly limits the possibility of achieving the desired transformation of the industry. However, the most unfavourable phenomenon is the structure of the current cadres – a mixture of: (1) political delegates and (2) experienced staff resistant to innovation and implementing new solutions. This structure of decision-makers in the mining sector guarantees the systematic regression of the industry. Educated, creative employees, capable of making the necessary changes and recommending needed solutions to optimise operations are treated as a threat to the status quo and marginalised.

" The qualifications of the management staff (as I understand it, I mean members of the management boards of companies, eventually the directors of mines) are high. However, the scope of such duties, and thus the necessary professional knowledge, technical skills, social competence (understood as complex skills conditioning the effectiveness of managing specific types of social situations), economic knowledge, qualifications in organisation and management, and occupational health and safety are to a large extent reduced to performing administrative tasks at the expense of the better use of the potential of these people in the field of their professional competences.

" These are mainly deficiencies in the skills of building effective teams, strategic management, innovation, openness to change, creativity, communication and question thinking, giving feedback, giving orders and enforcing them.

" The qualifications of the management team are, in my opinion, very high. Those in management roles are highly qualified, with an interdisciplinary and holistic approach to the problems of their organisation. These are people that often have an academic title. These people usually have extensive professional experience.

"I think that the biggest deficit is in the area of training in working with people – motivating, delegating, enforcing (soft HR).

"The qualifications of mining company employees holding managerial positions are rather sufficient in terms of professional knowledge or organisational skills, however, these employees often do not know labour law regulations, cannot perform their work under time pressure (stress).

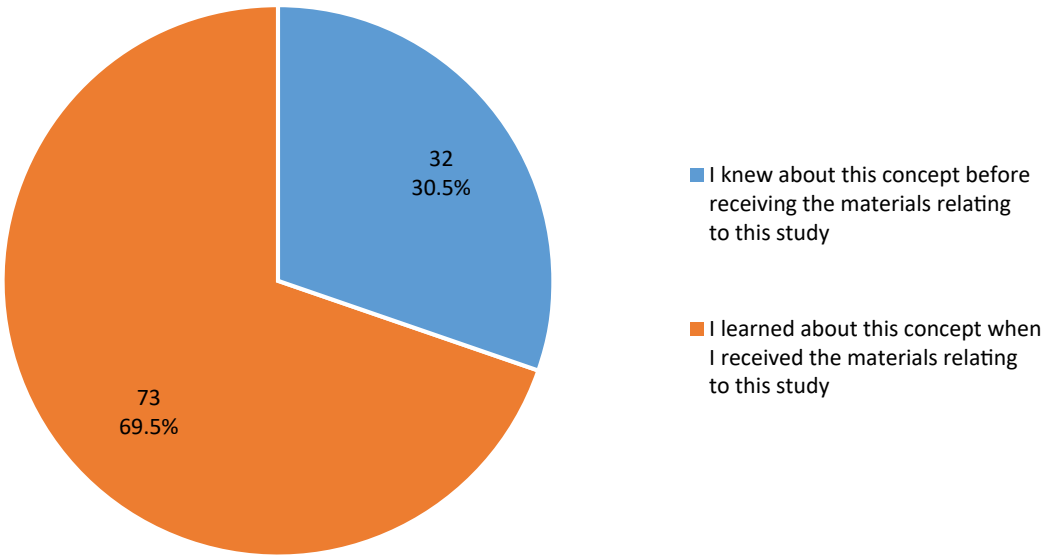
"Managers increasingly lack sufficient mining-related or even technical education. This translates into an increase in the responsibility of non-management employees and an increase in the number of procedures, reporting and project management methods being introduced, making the responsibilities of technical employees and their professional development more difficult.

### 3.3.3. Assessment of the Level of Knowledge and Understanding of the Premises of SQFM

The concept of the project was to provide those taking part in the empirical research with materials presenting the premises of the Sectoral Qualifications Framework for the Mining Sector (SQFM). The respondents were asked whether they were familiar with the concept before receiving the materials.

The data presented in Figure 15 show that less than one-third of the respondents had been exposed to the concept prior to this research project.

**Figure 15. First contact of the respondent with the concept of SQFM**

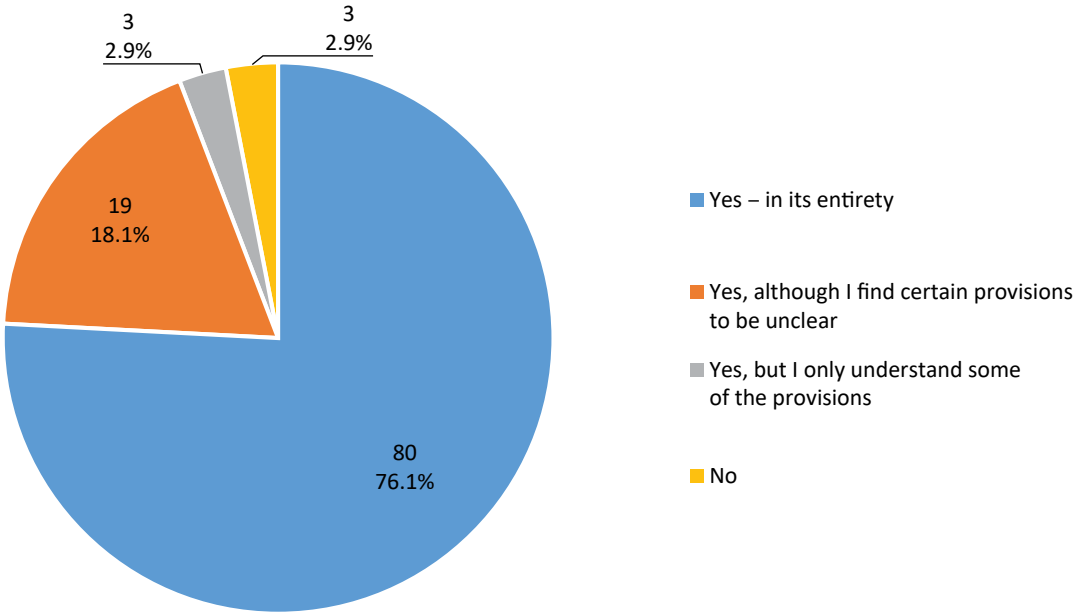



Source: own research and analysis, N=105.

The distribution of responses presented above indicates the need for wider dissemination of the SQFM premises.

Respondents were also asked to evaluate the draft document. The first issue concerned the overall assessment of the level of understanding of its premises. Detailed data are presented in Figure 16.

**Figure 16. Assessment of the level of understanding the principles of the proposed SQFM**




Source: own research and analysis, N=105.

The data presented above indicate a very high level of understanding the provisions of the document submitted for assessment. Almost all respondents stated that the document was prepared in an understandable way. Only one out of every twenty persons surveyed was critical of this issue.

Respondents declaring doubts about the provisions of the draft document were asked to indicate the element that was problematic. The recorded statements indicate that the main problems concerned: not entirely clear qualification criteria for particular positions, a lack of precision of some of the provisions, and concerns about the effectiveness of the introduced solutions.

The conclusions ensuing from the quantitative material are supplemented by the findings from the analysis of statements of the experts participating in the unstructured interviews on the extent to which the premises of the planned document are understood and potential problems in this regard. Their opinions should be assessed as generally positive (numerous laconic answers indicating a sufficient level of understanding of the document, e.g. "they are understandable" are not quoted in this report). However, some respondents indicated the existence of certain problems with the premises of the draft document. The most characteristic statements cited below reveal the indicated shortcomings.

"For me personally, I don't understand how this tool can be used directly for recruitment processes, career planning or courses and training to build up employees' qualifications.

"Unfortunately, in my opinion, the model presented is only the beginning of the road to developing more precise and clearer guidelines. From my perspective, it is so general and covers such a wide range of professional groups that in itself, it is only the basis for building a proper tool.

"I have no comment on the difficulty of understanding the proposed Sectoral Qualifications Framework for the Mining Sector, but I think that what is not understandable to non-management staff is the motivational aspect, i.e. how the SQFM is supposed to motivate an employee to obtain qualifications.

"The premises of SQFM are described in a clear way. The general nature of the level descriptors is described clearly. However expanding it to include specific solutions and issues would require a comprehensive approach. Non-managerial employees in mining companies may not understand the examples of the Polish Qualifications Framework descriptors for levels 6 and 8. In my opinion, managers should be able to understand all the elements.

Respondents also expressed their opinions on whether the various SQFM level descriptors were adequately detailed. The respondents were asked to refer separately to the provisions concerning underground mining, open-pit mining and borehole mining. The distribution of answers is presented in Table 7.

**Table 7. Assessment of the appropriate amount of detail in the SQFM level descriptors for underground, open-pit and borehole mining**

| Issue | Definitely yes | Rather yes | Rather no | Definitely no | Difficult to say | Total |
|---|---|---|---|---|---|---|
| **Assessment of the level of detail of the specific level descriptors presented in the SQFM for underground mining** | 52.3% | 44.8% | 0.0% | 0.0% | 2.9% | 100.0% |
| **Assessment of the level of detail of the specific level descriptors presented in the SQFM for open-pit mining** | 37.1% | 48.6% | 1.0% | 0.0% | 13.3% | 100.0% |
| **Assessment of the level of detail of the specific level descriptors presented in the SQFM for borehole mining** | 36.2% | 48.6% | 1.9% | 0.0% | 13.3% | 100.0% |

Source: own research and analysis, N=105.

The data contained in Table 7 indicate very high assessments of the respondents on the degree of detail in the entries of the draft document. In terms of each

identified sector, opinions prevailed indicating that the specificity of the issues regulated by the SQFM is at an appropriate level. It should also be noted that no responses were received indicating an extremely negative assessment of this issue for the particular mining methods. It is also worth stating that by far, the best assessment was given to the level of detail of the entries for underground mining. In relation to the provisions concerning open-pit and borehole mining, respondents were definitely more often unable to clearly state their position (this is probably due to the specific nature of the group participating in the study, in which people connected with the underground mining sector may have been over-represented).

Respondents were also asked to assess the extent to which the SQFM entries are understandable in the categories of knowledge, skills and social competence. The detailed distribution of answers is presented in Table 8.

**Table 8. Assessment of the comprehensibility of the SQFM entries**

| Issue | Definitely yes | Rather yes | Rather no | Definitely no | Difficult to say | Total |
|---|---|---|---|---|---|---|
| **Assessment of the comprehensibility of the SQFM level descriptors in the area of knowledge** | 74.2% | 22.9% | 1.0% | 0.0% | 1.9% | 100.0% |
| **Assessment of the comprehensibility of the SQFM level descriptors in the area of skills** | 83.7% | 12.4% | 1.0% | 0.0% | 2.9% | 100.0% |
| **Assessment of the comprehensibility of the SQFM level descriptors in the area of social competence** | 83.7% | 12.4% | 1.0% | 0.0% | 2.9% | 100.0% |

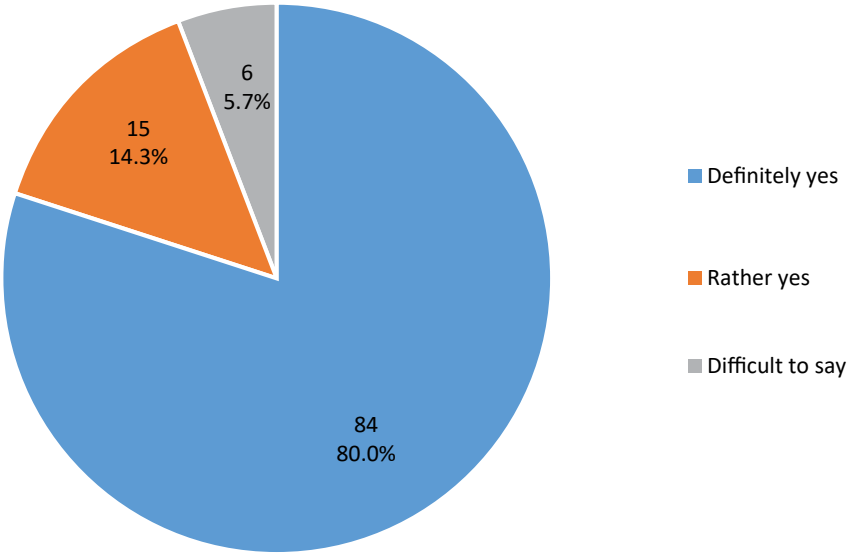
Source: own research and analysis, N=105.

The data indicate very high assessments from the respondents on the specified issues. Almost all respondents expressed positive opinions about the construction of the specific level descriptors in the analysed categories. It should be emphasised that none of the respondents gave an extremely negative opinion; problems with the unequivocal expression of their opinion rarely occurred, and a moderately negative opinion was declared only once.

Respondents expressing doubts about the issues being assessed were asked to supplement their opinions by indicating potential problems. Specific issues were mentioned only incidentally. Single responses referred to issues relating to such themes as the incomprehensibility of gradating skills, the inadequate matching of levels to individual employees, and the excessive focus on issues concerning social skills.

Respondents were also asked to reflect on the number of qualification levels determined for the mining sector. The data collected is presented in Figure 17.

**Figure 17. Assessment of the adequacy of the number of qualification levels for the needs of the mining sector**




Source: own research and analysis, N=105.

The distribution of answers presented above unequivocally indicates the positive opinions of respondents towards the proposed number of qualification levels for the sector – no one criticised the proposal, and only one in twenty respondents was unable to provide a definite opinion on this issue. The respondents who expressed doubts were asked to supplement their opinions by indicating potential problems. Only incidental doubts were mentioned about the lack of entries for levels 1 and 2 in this case.

The most characteristic statements of the surveyed experts, presented below, indicate their clearly positive assessment of the proposed number of qualification levels (3–8), however, single indications of shortcomings were expressed.

> "I believe that the number of levels is adequate to the needs, because from level 3, which is secondary school, a student should decide that he wants to follow this "path" – a path that will expand his knowledge and skills at different levels, where, looking towards the future, an employer from this very sector will be interested in [hiring] him.

> "I believe that the number of levels in the Polish Qualifications Framework is adequate to the needs of the mining sector. The mining industry is so extensive that the issue of human resources is widely covered here. The mining industry needs employees with different levels of qualifications, which will allow the avoidance of employing people below their attained professional qualifications.

> "I believe that the six levels are a good representation of the factual situation and will allow us to avoid the middle of the scale.

> "This division of levels is good and intuitive, except for level 5, which does not refer to any level of education (as, for example, level 4, which refers to the secondary school completion exam (matura) and level 6 to the licentiate degree). The general

framework is of course right on target, however, the level descriptions for specific positions would need to be expanded.

" For the most part, the SQFM level descriptors reflect the requirements of employers in the mining sector in terms of the qualifications needed for various positions. However, it seems to me that the level descriptors should be divided into open-pit, borehole and underground mining due to the different nature of these activities and operating methods used.

" It is worth noting that the skills for level 8, i.e. performing feasibility analyses of a mining investment including cost, market and benefit assessments for alternative solutions, should already be at competence level 7. At level 8, the coordination of scientific research is worth adding, which is often an integral part of mining projects. In addition, the scopes of levels 6–8 should be expanded to include aspects of project management.

" The qualification levels should correlate with each other both at the level of education and in the description of a specific job. For this purpose, a catalogue of positions present in the sector's companies should be created and include a basic description of their duties and the assignment of a specific qualifications framework level.

" Incomparable – the available requirements of employers include mainly the level of completed education, experience (work practice) and the scope of qualifications in terms of knowledge of the law and work regulations, in accordance with the Geological and Mining Act. The SQFM should also take into account whether the skills and knowledge assigned to each level are available during training at that level (vocational secondary schools, studies), and recommend this.

### 3.3.4. Assessment of the Effectiveness of Introducing SQFM

Respondents were also asked to assess the consequences of introducing the principles included in SQFM in relation to such aspects as: increasing the qualifications of employees, improving the training programme for employees, improving the education programme for those wishing to work in the mining sector, increasing the level of improvement in the comprehensiveness and completeness of qualifications, increasing the level of the effectiveness of employee recruitment, and increasing the comprehensiveness and completeness of possible career paths in mining. Detailed data are presented in Table 9.

**Table 9. Assessment of the effect of introducing the principles included in SQFM**

| Issue | Definitely yes | Rather yes | Rather no | Definitely no | Difficult to say | Total |
|---|---|---|---|---|---|---|
| **Assessment of an increase in the level of employees' qualifications due to the introduction of the principles included in SQFM** | 46.7% | 39.0% | 5.7% | 1.0% | 7.6% | 100.0% |
| **Assessment of an increase in the level of improvement of the employee training programme due to the introduction of the principles included in SQFM** | 49.4% | 41.0% | 3.8% | 1.0% | 4.8% | 100.0% |
| **Assessment of an increase in the level of improvement of the training programme for persons seeking employment in the mining sector due to the introduction of the principles included in SQFM** | 50.5% | 39.0% | 3.8% | 2.9% | 3.8% | 100.0% |
| **Assessment of an increase in the level of improvement of the comprehensiveness and completeness of qualifications due to the introduction of the principles included in SQFM** | 49.5% | 36.2% | 5.7% | 1.0% | 7.6% | 100.0% |
| **Assessment of an increase in the level of the effectiveness of employee recruitment due to the introduction of the principles included in SQFM** | 47.6% | 35.2% | 8.6% | 3.8% | 4.8% | 100.0% |
| **Assessment of an increase in the level of the comprehensiveness and completeness of the career paths available in mining due to the introduction of the principles included in SQFM** | 47.6% | 33.3% | 6.7% | 3.8% | 8.6% | 100.0% |

The presented data indicate a positive perception of the respondents in all specified areas of the changes that could take place as a result of implementing the Sectoral Qualifications Framework for the Mining Sector. The highest rating was given to the effectiveness of introducing the planned solutions in relation to increasing the level of improvements in the education system for people who want to work in the mining sector. However, the differences in comparison to the other identified issues were small.

It is important to note the relatively small differences in the answers "definitely yes" and "rather yes" for all the listed issues. This may indicate the existence of certain (rather low, one would think) doubts as to the effectiveness of the implemented document, despite its generally positive assessment. To a certain extent, this is confirmed by the percentages of respondents selecting the "difficult to say" option with respect to the particular issues being assessed. On the other hand, it is worth emphasising the rather rare expression of moderately and very negative assessments. In light of the collected data, it is possible to put forward the thesis that the respondents are generally convinced of the effectiveness of the introducing the SQFM, but have doubts about the results of its implementation.

The findings based on the quantitative material are supplemented by the conclusions formulated from analysing the statements of the experts participating in the

unstructured interviews on the impact of implementing SQFM on the effectiveness of the functioning of the mining industry. The surveyed experts unanimously emphasised the important role of the document in this aspect, although single critical comments were also voiced.

The most characteristic statements cited below indicate the specific effects that could potentially arise in connection with the implementation of the document.

"It can certainly be a helpful tool in determining needs for recruitment, promotions. It can be a great help in managing training and building the skills of employees.

"Employers are not always aware of the exact scope of the tasks and responsibilities of employees, due to extensive ladder diagrams in the organisations. With this new tool, they will be able to categorise employees in accordance with the industry competence model. This will allow them to optimise their employment structure and make better use of their human resources. Managers will also be able to plan employment and employee development, remuneration and retention more quickly, efficiently and accurately.

"Definitely yes. Implementation of the principles included in SQFM would allow for better planning of employee training and education, a precise diagnosis of competences and, consequently, the possibility of recognising competences outside formal education. Certainly the introduction of these principles will make it possible to improve the quality of teaching, streamline and support recruitment processes or the management of employees' professional promotion.

"The premises set out in the SQFM will, in my opinion, have a positive impact on the effectiveness of the mining industry by, among other things, identifying key areas of competence and qualifications awarded in the mining industry and improving the vocational education and training offer to meet the current needs of mining.

"The implementation of SQFM will not improve the effectiveness of the mining industry's functioning without a real willingness on the part of cadres and managers to hand over a significant piece of competence and decision-making to industry professionals capable of generating progress.

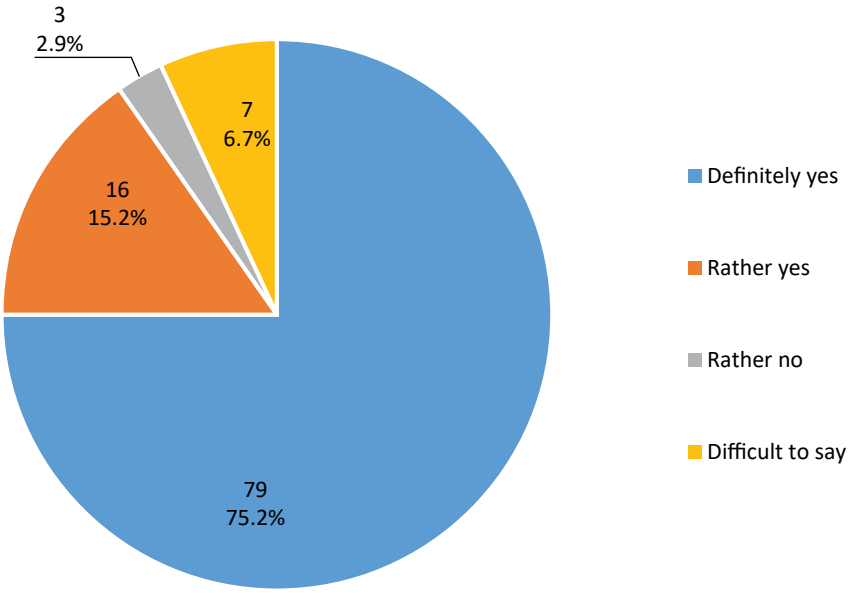
"The implementation of the principles could positively influence the functioning of the mining industry indirectly, through a more objective selection of candidates for a job. Applying the SQFM could allow for the more accurate selection of non-managerial staff and, above all, of staff who perform these functions.

"It should have a positive impact on the effectiveness of operations, especially in terms of the ability to plan long-term investments and development (or transformation) of mining enterprises, thanks to the possibility of identifying the competence gaps in the market and having a real impact on changes in educational programmes.

> A consequence of the implementation of the principles may be the unification of recruitment criteria for work in the foreign market, provided that the criteria are symmetrical and internationally compatible, which will be difficult due to the multiplicity of education profiles. To talk about the impact of SQFM principles on effectiveness, these criteria should be enforced during recruitment and followed universally, which is unlikely to happen, as recruitment is an internal, individual process. In the domestic market, recruitment with the verification of completed studies, schools or specialised courses in its current form works well.

Another issue analysed was the relationship between introducing the SQFM and the situation in the labour market. In this problem area, correspondence between employers' requirements and the SQFM entries in relationship to the qualifications required to work in the sector was assessed. A detailed distribution of respondents' answers on this issue is presented in Figure 18.

**Figure 18. Assessment of the correspondence between the requirements of mining sector employers and the SQFM entries in relationship to the qualifications required to work in various job positions**




Source: own research and analysis, N=105.

The survey results presented above indicate that respondents have no doubt that the SQFM entries are very good at reflecting the requirements of employers for potential and current employees. Three-quarters of the interviewees did not have any doubts relating to these entries. It should be noted that none of the respondents formulated a very critical opinion on this issue, and moderately negative answers or those indicating no clearly defined position appeared very rarely.

Respondents declaring doubts on this issue were asked to supplement their opinions by indicating potential problems. Respondents drew attention to the strong variation in employers' expectations, as well as the specificity of the work of different job positions, which makes it impossible to make a definitive assessment. Moreover, it was mentioned that the SQFM entries are too imprecise in this regard

and the dynamically changing conditions in the labour market make it impossible to unequivocally assess this issue.

The conclusions from the quantitative material are supplemented by the findings from analysing the statements of the experts participating in the unstructured interviews on assessing the correspondence of the requirements of employers in the mining sector with the SQFM entries in terms of the qualifications needed to work in various positions. The opinions formulated (mostly very laconic) positively assess this issue. Nevertheless, the respondents indicated the existence of certain problems relating to the premises of the draft document in this respect. The most characteristic statements of the experts referring to this issue are quoted below.

> "I believe that the SQFM level entries reflect the requirements of employers. The entries are presented in a clear, simple and specific manner, capturing the range of qualifications that are necessary for a given job.

> "I believe that the SQFM level entries reflect the requirements of employers in the mining sector regarding the qualifications needed to work in various positions. The entries contain all the necessary elements.

> "There is a lack of demonstrated knowledge and skills in design work for borehole mining (other than those that are in common) and all mining, drilling and decommissioning work in borehole mining is conducted on the basis of designs prepared by people in the industry and approved by the management of the mining operations. My suggestion is to clarify this.

> "Qualifications in mining are so broad that the proposed division does not cover the actual needs.

As an elaboration of the issue discussed above, the survey also asked respondents to formulate assessments relating to: the effects of implementing SQFM on developing qualification criteria relevant to the needs of employers in the mining sector, the effects of implementing SQFM on developing education and training programmes more relevant to labour market needs, and the effects of implementing SQFM on the clarity and precision of the definition of criteria for professional promotion in the mining sector. A detailed distribution of responses is provided in Table 10.

**Table 10. Assessment of the impact of implementing SQFM on the process of professional improvement**

| Issue | Definitely yes | Rather yes | Rather no | Definitely no | Difficult to say | Total |
|---|---|---|---|---|---|---|
| **Assessment of the impact of SQFM implementation on developing criteria for qualifications that adequately meet the needs of employers in the mining sector** | 75.2% | 16.2% | 2.9% | 0.0% | 5.7% | 100.0% |
| **Assessment of the impact of SQFM implementation on developing more adequate education and training programmes for labour market needs in the mining sector** | 76.2% | 19.0% | 1.0% | 1.0% | 2.9% | 100.0% |
| **Assessment of the impact of SQFM implementation on the clarity and precision of defining the criteria for career promotion in the mining sector** | 71.4% | 13.3% | 6.7% | 2.9% | 5.7% | 100.0% |

Source: own research and analysis, N=105.

The data presented above unequivocally show the positive assessments in each of the specified aspects. Roughly three-quarters of the respondents formulated positive assessments in relation to each of the specified issues. However, it is worth noting that the assessment of the impact of implementing SQFM on the clarity and precision of the definition of criteria for professional promotion in the mining sector is the least favourable. This may be a result of the less precise entries in this respect or the pathological phenomena signalled by respondents (nepotism and corruption), which are so strongly present in the analysed social sphere that the introduction of formal regulations does not guarantee their elimination.

Respondents expressing certain doubts about the discussed matters were asked to supplement their opinions by indicating potential problems in the specified areas. They indicated the existence of problems relating to the qualification criteria actually functioning in the sector, a social reality that is not conducive to implementing the document's provisions, inadequacy of the training provided thus far in relation to the requirements included in the SQFM, and doubts about the compatibility of the document's provisions with binding legal regulations.

## 3.4. Conclusions and Recommendations Resulting from the Study

On the basis of the prepared draft of the Sectoral Qualifications Framework for the Mining Sector and the conducted research, conclusions and recommendations were formulated, which can be summarised as follows:

- The concept of the Polish Qualifications Framework (PQF) is known, however it would be worthwhile to conduct activities to further popularise the solutions for employment and professional advancement in the mining sector. In particular, activities should be undertaken to promote the premises of the Sectoral Qualifications Framework for Mining (SQFM) in the sector at the stage of its implementation.

- No objections were raised regarding the legitimacy of implementing a framework to regulate qualifications. The most important benefits associated with implementing the planned solutions include a clear systematisation of qualifications' criteria, facilitating the determination of professional career paths, facilitating the planning and implementation of training and vocational courses, unifying the education system in Poland with European solutions, and systematising the confirmation of skills, knowledge and competences.

- The assessment of the competences, knowledge and qualifications of non-managerial employees is generally positive. At the same time, however, some deficits were indicated. The most important of these relate to relatively weak social competence ("soft skills"). Additionally, other issues were raised among the deficits, such as: the lack of appropriate education, lack of practical experience, lack of responsibility for entrusted equipment, lack of willingness to develop professionally, lack of innovation in thinking and acting.

- The assessment of the competences, knowledge and qualifications of management staff is generally positive. At the same time, however, certain deficits were noted. The most important of these is relatively weak social competence ("soft skills") and organisational and management abilities. Moreover, among the deficits indicated were such issues as: the lack of education in a relevant field, lack of experience, deficiencies in innovative thinking and acting. In particular, attention should be paid to issues relating to social competence and the organisation and management of work teams.

- The SQFM entries are highly assessed as being understandable and clear, and the concept itself was viewed positively as a preliminary draft.

- The degree of detail in the entries relating to underground, open-pit and borehole mining was assessed as adequate. The level of detail in the entries for underground mining was considered the best. Attention should be paid to the level of detail in the entries for open-pit and borehole mining.

- The assessment of the comprehensibility of the SQFM entries in relation to the levels of knowledge, skills and social competence is high. Incidental comments revealed concerns about: a lack of understanding about the presented gradation

of skills, inadequate matching of levels to particular job positions, and an excessive focus on issues relating to social competence.

- Positive opinions were expressed regarding the proposed number of qualification levels in the sector. Some doubts were raised about the descriptors for level 5 and the lack of a level 2. A single opinion concerned the inadequacy of the level descriptors in response to employers' requirements.

- The effectiveness of introducing the principles presented in SQFM was generally assessed as positive in areas such as increasing the qualifications of employees, improving the training programme for employees, improving the education programme for people wanting to work in the mining sector, increasing the level of improvement in the comprehensiveness and completeness of qualifications, increasing the level of effectiveness of employee recruitment, and increasing the comprehensiveness and completeness of career paths possible in the mining sector. The effectiveness of introducing the planned solutions was assessed most highly in relation to an increase in the level of improvement of the education system for people wishing to work in the mining sector.

- The influence of SQFM on optimising the employment structure, better planned training, more effective use of human resources, and improving the vocational education and training offer to meet the current needs in the mining sector were emphasised.

- In the opinion of respondents, the requirements of employers towards potential and current employees are well reflected in the provisions of the SQFM entries. However, differentiating the expectations of employers, as well as the specificity of work in different positions are problematic, which may affect the ability to connect the document to employers' expectations. A single comment was also made that the SQFM entries are too imprecise in this respect.

- On the basis of the survey, it was concluded that the preliminary draft of the SQFM did not require any changes resulting from the conclusions of the respondents and on this basis, it was adopted as the proposed SQFM and recommended for inclusion in the Integrated Qualifications Register.

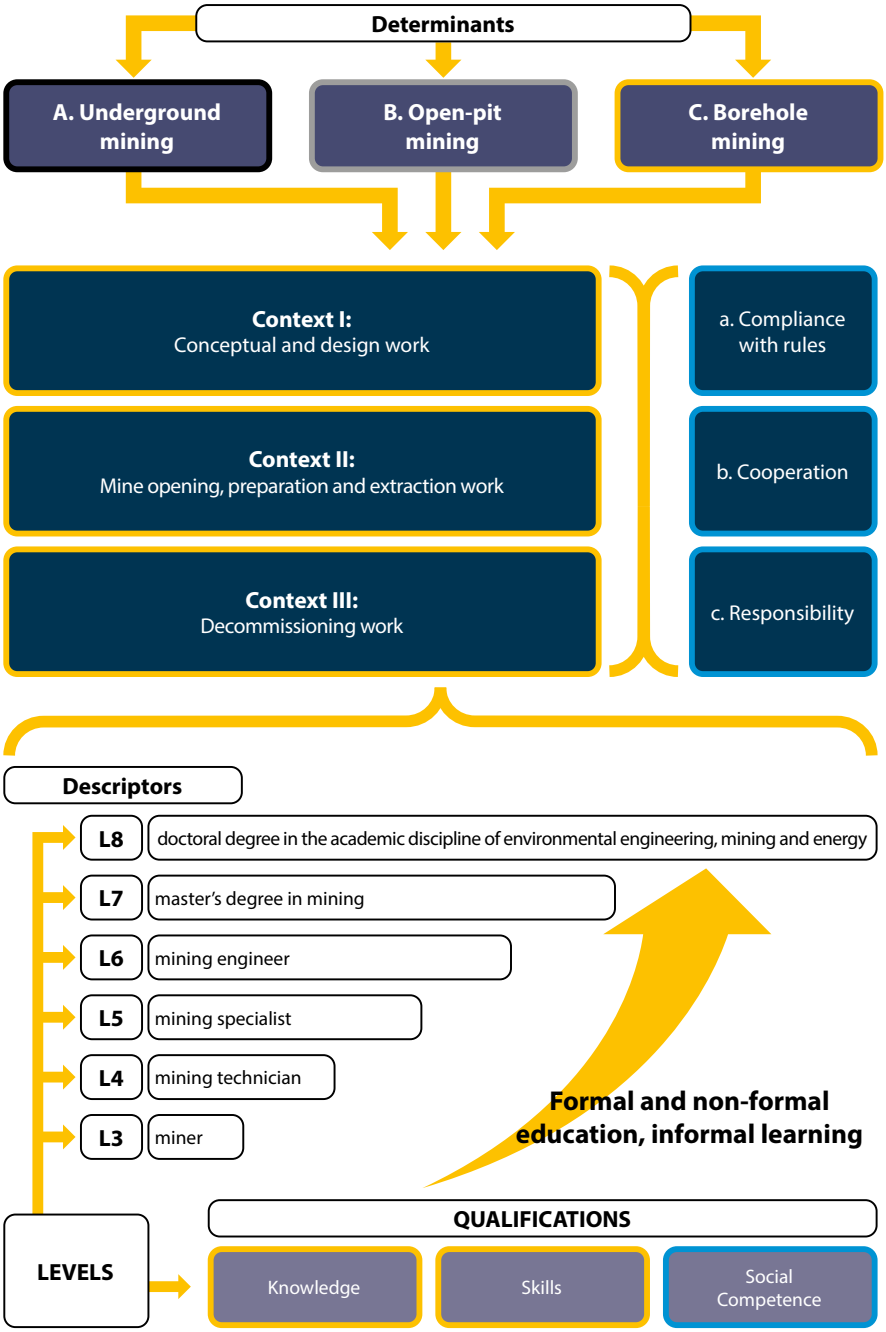
# 4. Using SQFM

## 4.1. Using SQFM – Instructions on Reading the Level Descriptors

The starting point for the description of the Sectoral Qualifications Framework for the Mining Sector are the sectoral determinants (A, B, C), which, depending on the context (I, II, III) are described by sets of learning outcomes (K, S, C) with associated level descriptors (3–8). Social competences are taken as a whole, without division into determinants, and described in the aspects of compliance with rules, cooperation, and responsibility. Level 3 corresponds to the qualifications of a miner. Level 4 describes a mining technician qualification. The next, level 5, corresponds to a mining specialist. Level 6 is the level of a mining engineer and level 7 refers to a master's level mining engineer. The last level, level 8, corresponds to the doctoral degree in the scientific discipline of environmental engineering, mining and energy. A graphical visualisation of the SQFM structure is presented in Figure 19.

The SQFM assumes a progression and accumulation of learning outcomes as one moves to higher levels of qualifications, by acquiring knowledge, skills and social competences through both formal and informal learning. The qualification level descriptors take into account the accumulation of learning outcomes, the increased complexity of the work, and the responsibility for the entrusted human and material capital.

**Figure 19. Structure of SQFM**




In order to make it easier for potential users to navigate the SQFM, individual entries have been given an identification code for the descriptors (e.g. I.K.R.L5). The individual elements of the code should be understood as follows:

**I, II, III** – symbol for the context of the sectoral determinant:

Context I – Conceptual and design work

Context II – Mine opening, preparation and extraction work

Context III – Decommissioning work

**K** – Knowledge

**S** – Skills

**C** – Social competence

**L** – Level (appears with a number 3–8)

**A, B, C, R** – symbol for the sectoral determinant:

Determinant A – Underground mining

Determinant B – Open-pit mining

Determinant C – Borehole mining

**R** – Common to all determinants (A, B and C)

**a, b, c** – symbol for the social competence group:

a – Compliance with rules

b – Cooperation

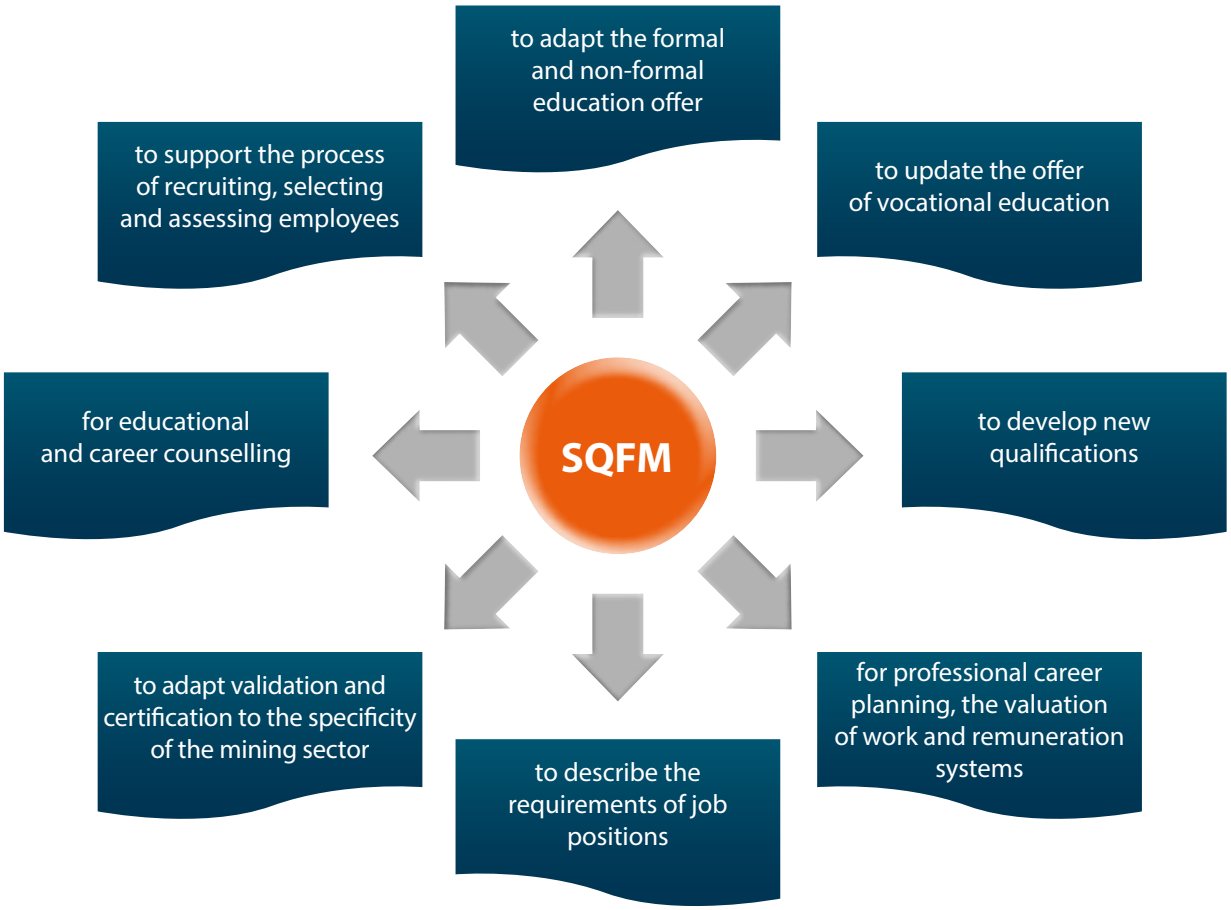
c – Responsibility

The SQFM entries enable potential users to analyse required qualifications in both the entire mining sector and in a selected sub-sector (underground mining, open-pit mining, borehole mining) in terms of knowledge, skills and social competence, taking into account the context (I, II, III). Comparing the relationships among individual levels (3–8) makes it possible to identify competence gaps and to determine a specific career path.

## 4.2. Applying SQFM

A significant aspect of the structure of SQFM is its potential for further application and use. According to the expert team, the framework is an important element for systematising qualifications in the mining sector. Figure 20 presents the main areas in which the SQFM can be applied.

**Figure 20. Main areas in which SQFM can be applied**




In analysing the possibilities for using SQFM, the project team identified five main areas:

1. use by training institutions,
2. use by validation institutions and awarding bodies,
3. use by institutions developing descriptions of qualifications,
4. use by employers,
5. use by employees.

The results of the analysis are presented in Table 11.

**Table 11. Areas in which SQFM can be applied**

| | Potential application of SQFM |
|---|---|
| **By training institutions** | • to analyse the market demand for new qualifications using the SQFM level descriptors<br>• to compare the sets of learning outcomes (when designing market qualifications) with the SQFM level descriptors<br>• to design training offers for a given qualification using the language of learning outcomes and the terminology used in SQFM<br>• to design social competence training relating to the descriptors of the corresponding SQFM level |
| **By validation institutions and awarding bodies** | • to assess the mastery of those learning outcomes that are most relevant to the persons attaining qualifications, i.e. the employer and the employee<br>• to design the validation of social competence, knowledge and skills in accordance with the descriptors of the relevant SQFM level<br>• to adapt training programmes to the specific needs of employers in the mining industry, using the detailed SQFM level descriptors, taking into account the specific contexts and sectoral determinants<br>• to prepare recommendations for training participants on further career paths – improving their professional qualifications on the basis of analysing the descriptors of adjacent SQFM levels<br>• to support the planning process of validation and certification, also through the consistent use of terminology |
| **By institutions developing descriptions of qualifications** | • to describe qualifications or develop training and education programmes<br>• to determine the PQF and SQF level of a qualification, training or education programme<br>• to prepare a brief description characterising a new qualification, training or education programme, using the definitions of the SQFM sectoral determinants and contexts in order to identify the professional tasks that a person with this qualification should be able to perform<br>• to distinguish sets of learning outcomes for a new qualification |
| **By employers** | • to conduct employment policies and plan the employment of qualified personnel in mining companies<br>• to identify the key competences needed for a job position (based on the detailed descriptions of SQFM level descriptors)<br>• to adapt a company's training policy to the needs of employers and hired employees<br>• to specify job offers for employees in line with the specificity of the company by using the SQFM contexts<br>• to perform a comparative analysis of the qualifications of employed workers for the purpose of developing a rational remuneration system in the company<br>• to perform a self-assessment of employer qualifications relating to mining activities, their competence level in relation to the SQFM, and to plan one's own development<br>• to have the HR departments of mining companies apply the elements of the SQFM (e.g. to support recruitment processes and employee assessment, career development, work valuation and the pay system) |

**Potential application of SQFM**

| | |
|---|---|
| **By employees** | • to plan individual professional development paths<br>• to precisely define one's competence level and to orient oneself on the possibilities and directions of professional development, both in terms of vertical promotion and horizontal development; moreover, to define one's competences and to assign the framework level to the qualifications attained through various educational paths<br>• to identify competence gaps in knowledge, skills and social competence (thus the SQFM indicates areas that should be improved) and define the requirements for vertical qualification development (attaining qualifications at higher levels of the framework), leading to professional advancement in the structure of the investment process and the company<br>• to precisely understand the requirements formulated in job offers (in cases when SQFM level criteria and descriptors are used) and to compare them with one's own qualifications |

The first step towards achieving these objectives should be to apply for the inclusion of SQFM in the Integrated Qualifications System.

# 5. Summary

Mining is and may in the future continue to be one of the most important sectors of the Polish economy, despite EU actions under its Fair Transition Fund to replace fossil fuels with renewable energy. The mining sector continues to generate high sales revenues, which translate directly into the added value it generates and its impact on Poland's GDP. It is important to add that the project distinguished the companies of three mining subsectors: underground mining, open-pit mining and borehole mining. During the project, consultations were held with major stakeholders. In the case of underground mining, these were: KGHM Polska Miedź S.A., Polska Grupa Górnicza S.A., Jastrzębska Spółka Węglowa S.A., LW Bogdanka S.A., Tauron S.A.; open-pit mining: Polska Grupa Energetyczna S.A.; and borehole mining: PGNiG S.A., Lotos S.A. and Orlen S.A. The aforementioned subsectors and enterprises have strategic importance for Poland, which is evidenced by their capital structure and the fact that they are often national operators in their given field. The rapid technological changes taking place in the mining industry, especially in relation to automation and robotisation, are leading to changes in the demand for employee competences. The result of these changes is the occurrence of competence gaps in the workforce, which are due to the mismatch between the educational offer and the needs of employers in the sector. Hence, the mining industry is facing significant staff shortages, and the demand for new, qualified employees will grow in the coming years. This is why the development of the Sectoral Qualifications Framework for the Mining Sector was begun. The qualifications developed within the framework of SQFM enables them to be compared to qualifications included in the Integrated Qualifications System.

The most important element of the SQFM are the qualification level descriptors. After defining the sector's boundaries and defining the sectoral determinants and activity contexts, the project team elaborated descriptors that constitute synthetic descriptions of the qualifications in mining, including its subsectors. The qualification descriptors were validated during the competence study, where the entries were critically analysed and appropriately generalised and supplemented.

The project developed SQFM level descriptors that are fully aligned with the Polish Qualifications Framework, meaning that they are presented in the form of learning outcomes and reflect the progress of a learner: they show how learning in different contexts and at different stages of life results in gains in knowledge, skills and social competence.

The SQFM level descriptors take into account the specific characteristics of the mining sector, its typical terminology and fall between levels 3 and 8, which were indicated as adequate for the specificity of the sector, resulting from the assignment of appropriate levels to formal qualifications. The starting point for the description of the SQFM are the sectoral determinants (A, B, C), which, depending on the context (I, II, III) are described by sets of learning outcomes (K, S, C) with associated level descriptors (3–8). Social competences are taken as a whole, without division into determinants, and described in the aspects of: compliance with rules, cooperation, and responsibility. Level 3 corresponds to the qualifications of a miner. Level 4 describes a mining technician qualification. The next level – 5,

corresponds to a mining specialist. Level 6 is the level of a mining engineer and level 7 refers to a master's level mining engineer. The last level – 8, corresponds to a doctoral degree in the scientific discipline of environmental engineering, mining and energy.

It is assumed that promoting SQFM principles in the mining industry will make it possible to systematise the criteria of qualifications, facilitate the planning of professional career paths, facilitate the planning and implementation of training and vocational courses, unify the education system in Poland in relation to European solutions, and make it possible to systematise the confirmation of skills, knowledge and competences. In particular, the project team has identified five main areas where SQFM can be used:

1. by training institutions,

2. by validation institutions and awarding bodies,

3. by institutions developing descriptions of qualifications,

4. by employers,

5. by employees.

The validation of the entries of the SQFM showed that they are understandable and clear, and the concept itself is positively perceived as a proposal. The degree of detail in the entries relating to underground, open-pit and borehole mining was assessed as appropriate.

In summary, it should be stated that the SQFM is an innovative solution, which can be a tool to support the systematisation of existing qualifications relevant to the mining industry and to develop new qualifications in response to social, economic, technical, technological and organisational changes.

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# Annex:
# Sectoral Qualifications Framework for the Mining Sector

| Context | Category | Determinant | Level 3 | Level 4 | Level 5 | Level 6 | Level 7 | Level 8 |
|---|---|---|---|---|---|---|---|---|
| Conceptual and design work | Knowledge (knows and understands) | All determinants | I.K.R.L3 | I.K.R.L4 | I.K.R.L5 | I.K.R.L6 | I.K.R.L7 | I.K.R.L8 |
| | | | --- | the importance of geological, geodesic, geophysical and drilling information for conceptual and design work | the procedures for processing and using geological, geodesic, geophysical and drilling information for conceptual and design work | the procedures for acquiring geological, geodesic, geophysical and drilling information for conceptual and design work | the IT tools for processing and using geological, geodesic, geophysical and drilling information for conceptual and design work | the innovative research tools for processing and using geological, geodesic, geophysical and drilling information for conceptual and design work |
| | | | --- | the technical and technological requirements and restrictions as well as those resulting from natural hazards and occupational safety | environmental requirements and restrictions | the requirements and restrictions resulting from geological and mining law as well as industry regulations and standards | the requirements and restrictions resulting outside the industry arising from related laws (e.g. Water Law Act, Environmental Protection Law, Farm and Woodland Conservation Act) | the innovative research tools for assessing the impact of requirements and restrictions |
| | | | --- | the methods, techniques, technologies and mining systems applied in the country for simple geological and mining work and for preparing mined materials for use in the economy | the methods, techniques, technologies and mining systems applied globally for simple geological and mining work and for preparing mined materials for use in the economy | the methods, techniques, technologies and mining systems applied both in the country and globally for complex geological and mining work and for preparing mined materials for use in the economy | the methods, techniques, technologies and mining systems applied both in the country and globally for geological and mining work under restricted conditions and for preparing mined materials for use in the economy | the innovative methods, techniques, technologies and systems for mining and preparing mined materials for use in the economy |
| | | | --- | the content and partial scope of the documentation needed to commence mining work | the content and full scope of documentation needed to commence mining work | the administrative procedures approving the documentation needed to commence mining work | the interrelationship between the documentation needed to commence mining work | — |
| | Skills (is able to) | All determinants | I.S.R.L3 | I.S.R.L4 | I.S.R.L5 | I.S.R.L6 | I.S.R.L7 | I.S.R.L8 |
| | | | --- | understand geological, geodesic, geophysical and drilling information and use them to a limited extent | process and adapt geological, geodesic, geophysical and drilling information | acquire geological, geodesic, geophysical and drilling information | use computer programs to manage geological, geodesic, geophysical and drilling data | use computer programs to model geological, geodesic, geophysical and drilling data |
| | | | --- | support the activities necessary to obtain a mining licence | plan the activities necessary to obtain a mining licence | coordinate the activities necessary to obtain a mining licence | supervise the administrative process, in particular compliance with the Geological and Mining Act and the Code of Administrative Procedure | conduct a dialogue with institutions participating in administrative proceedings using current knowledge and experience |
| | | | --- | prepare parts of the documents necessary to obtain a mining licence | prepare, with relevant support, the documents necessary to obtain a mining licence | autonomously prepare the documents necessary to obtain a mining licence | identify threats and opportunities for the designed mining investment and analyse risk factors relating to the implementation of the design | conduct a feasibility study of a mining investment taking into account the assessment of costs, the market, and benefits of alternative solutions |
| | | | --- | develop a mining project for simple geological and mining conditions | develop multiple variants of a mining project for simple geological and mining conditions | develop a mining project for complex geological and mining conditions | develop a mining project for complicated geological and mining conditions | propose innovative solutions at the design stage |
| Mine opening, preparatory and extraction work | Knowledge (knows and understands) | All determinants | II.K.R.L3 | II.K.R.L4 | II.K.R.L5 | II.K.R.L6 | II.K.R.L7 | II.K.R.L8 |
| | | | the construction of simple mining machines and equipment | the construction of complex mining machines and equipment and the basic principles of building technological systems | the construction of specialised mining machines and equipment and the principles of building technological systems | the methods of analysing complex technical solutions concerning mining machinery and equipment with the use of IT tools | the methods and measures of analysing complex technical solutions concerning mining machinery and equipment with the use of advanced IT tools | the methods and measures of analysing complex technical solutions concerning mining machinery and equipment with the use of innovative computer methods |
| | | | the methods, techniques, technologies and mining systems used for simple geological and mining work as well as for preparing mined materials for use in the economy, applied in a mining facility in Poland | the methods, techniques, technologies and mining systems applied in the country for simple geological and mining work as well as for preparing mined materials for use in the economy | the methods, techniques, technologies and mining systems applied globally for simple geological and mining work as well as for preparing mined materials for use in the economy | the methods, techniques, technologies and mining systems applied both in the country and globally for complex geological and mining work as well as for preparing mined materials for use in the economy | the methods, techniques, technologies and mining systems applied both in the country and globally for geological and mining work under restricted conditions as well as for preparing mined materials for use in the economy | the innovative methods, techniques, technologies and systems for mining and preparing mined materials for use in the economy |
| | | | the impact of basic mining activities | the cause of the impact of mining activities | the assessment methods and extent of the impact of mining activities | the methods and techniques for measuring impact | the mining methods and techniques for reducing impact | the software and IT tools for monitoring and forecasting the impact of mining activities on the environment |

| Context | Category | Determinant | Level 3 | Level 4 | Level 5 | Level 6 | Level 7 | Level 8 |
|---|---|---|---|---|---|---|---|---|
| Mine opening, preparatory and extraction work | Knowledge (knows and understands) | All determinants | the specialised activities and work associated with opening, preparing, mining and processing mined materials (taking place in enrichment facilities operating within the organisational or processing units of mining companies) | the advantages and disadvantages of the specialised activities and work associated with opening, preparing, mining and processing mined materials (taking place in enrichment facilities operating within the organisational or processing units of mining companies) | the conditions for the application of specialised activities and work associated with opening, preparing, mining and processing mined materials (taking place in enrichment facilities operating within the organisational or processing units of mining companies) | the organisation of specialised activities and work associated with opening, preparing, mining and processing mined materials (taking place in enrichment facilities operating within the organisational or processing units of mining companies) | the organisation of specialised activities and work associated with opening, preparing, mining and processing mined materials (taking place in enrichment facilities operating within the organisational or processing units of mining companies) using computer methods | the methodologies of the specialised activities and work associated with opening, preparing, mining and processing mined materials (taking place in enrichment facilities operating within the organisational or processing units of mining companies) using innovative computer methods |
| | | | the concepts concerning natural hazards, occupational health and safety, fire prevention | the concepts concerning environmental protection and ergonomics | the relationship between natural hazards and occupational safety | the causes and mechanisms of the occurrence of natural hazards | the methods of monitoring natural hazards | the specialised methods of forecasting natural hazards |
| | | | the operating parameters of machines, equipment and technological systems | the methods of acquiring the operating parameters of machines, equipment and technological systems | the methods of interpreting the operating parameters of machines, equipment and technological systems | the influence of the parameters on the economic effect of operating machines, equipment, and technological systems using various technical solutions | the principles of using the appropriate operating parameters of machines, equipment and technological systems in accordance with changing geological and mining conditions | the methods and measures of optimising the operating parameters of machines, equipment and technological systems |
| | | | the readings of control and measurement instruments to identify emergency conditions | the procedures of addressing failures and complications | the specialised procedures of addressing failures and complications | the specialised procedures of addressing failures and complications as well as the methods and technologies used to eliminate them | the importance of the technical condition of machines for the effectiveness of performing mining tasks | the specialised methods of forecasting the failures of machines and equipment |
| | | | the importance of knowledge about electrical engineering, pneumatics, hydraulics and mechatronics | the main concepts and solutions of electrical engineering, pneumatics, hydraulics and mechatronics | the conditions of applying the solutions of electrical engineering, pneumatics, hydraulics and mechatronics | the limitations of applying the solutions of electrical engineering, pneumatics, hydraulics and mechatronics in a mining plant | the methods of assessing the applied solutions of electrical engineering, pneumatics, hydraulics and mechatronics | the procedures for implementing the innovative solutions of electrical engineering, pneumatics, hydraulics and mechatronics |
| | | | the aim, tasks and organisation of mine rescue operations in mining plants | the general principles of conducting rescue operations in mining plants | the principles of conducting specialised rescue operations in mining plants | the principles of organising conducted rescue operations in mining plants | the technical limitations and principles of controlling the course of rescue operations in mining plants using IT tools | the innovative methods used to maintain safety during rescue operations in mining plants |
| | | | the machines and equipment used for the construction of spoil tips or mining waste disposal facilities | the techniques and technologies of forming spoil tips or mining waste disposal facilities | the possible economic solutions of managing earth and rock masses | the technical, technological, formal and legal restrictions on the location of spoil tips or mining waste disposal facilities | the importance of the geotechnical parameters of earth and rock masses in the design of spoil tips or mining waste disposal facilities | the algorithms optimising the technology of constructing spoil tips or mining waste disposal facilities in the context of the economic result |
| | Skills (is able to) | All determinants | **II.S.R.L3** | **II.S.R.L4** | **II.S.R.L5** | **II.S.R.L6** | **II.S.R.L7** | **II.S.R.L8** |
| | | | understand selected documents included in measurement and geological documentation | prepare free-hand drawings of height maps and geological and mining cross-sections | list the types of documents included in measurement and geological documentation, prepare height maps and geological and mining cross-sections using computer techniques | coordinate the development of measurement and geological documentation within the legally required due dates | use measurement and geological documentation with the application of basic computer programs | use measurement and geological documentation with the application of advanced computer programs |
| | | | — | prepare selected documents required for the operation of a mining plant | list the types of documents required for the operation of a mining plant | prepare the documentation required for the operation of a mining plant using basic computer programs | prepare the documentation required for the operation of a mining plant using specialised computer programs | prepare the documentation required for the operation of a mining plant using state-of-the-art IT tools |
| | | | select tools to perform the work of operating a mining plant | select technical equipment to perform the work of operating a mining plant | select basic technological systems to perform the work of operating a mining plant | select advanced technological systems to perform the work of operating a mining plant | optimise the selection of technological systems used to operate a mining plant | assess the work of the machines, devices and technological systems using advanced computer tools |
| | | | operate the basic equipment used to run a mining plant | operate the equipment used to run a mining plant | operate specialised equipment used to run a mining plant | organise and operate specialised equipment used to run a mining plant | optimise the way equipment is used to run a mining plant | optimise the way equipment is used to run a mining plant with the application of innovative IT tools |
| | | | understand control and measurement instrument readings | interpret control and measurement instrument readings | prepare tables, diagrams and charts based on control and measurement instrument readings | analyse the results of control and measurement instrument readings and apply them to model further operations and mining tasks | analyse the results of instrument readings and apply them to model further operations and mining tasks using specialised software | identify the results of instrument readings and apply them to model and optimise further operations and mining tasks using specialised software |

| Context | Category | Determinant | Level 3 | Level 4 | Level 5 | Level 6 | Level 7 | Level 8 |
|---|---|---|---|---|---|---|---|---|
| Mine opening, preparatory and extraction work | Skills (is able to) | All determinants | recognise natural hazards and apply preventive measures | assess the scale of a natural hazard and apply preventive measures | assess and predict natural hazards using advanced methods and supervise the application of preventive measures | assess and predict natural hazards using IT methods and supervise the application of preventive measures | supervise the application of natural hazard preventive measures in the case of multiple hazards | supervise the implementation of innovative measures to prevent natural hazards using IT tools |
| | | | apply the regulations on occupational health and safety, fire prevention, environmental protection and the procedures of performing especially hazardous work in mining | know the regulations on occupational health and safety, fire prevention, environmental protection and the procedures of performing especially hazardous work as well as identify and take them into account in an adequate manner when designing, implementing, performing and managing mining processes and projects | optimise the regulations on occupational health and safety, fire prevention, environmental protection and the procedures of performing especially hazardous work | develop new regulations on occupational health and safety, fire prevention, environmental protection and the procedures of performing especially hazardous work | critically assess the regulations on occupational health and safety, fire prevention, environmental protection and the procedures of performing especially hazardous work | — |
| | | | — | estimate the costs of individual operations and mining tasks | estimate the costs of technological systems | assess the costs of performed mining activities | optimise the costs of individual operations and mining tasks, technological systems and performed mining activities | select new indicators to economically assess operations and mining tasks, technological systems and performed mining activities |
| | | | use basic personal and collective protective equipment | supervise the use of basic personal and collective protective equipment | supervise the use of specialised personal and collective protective equipment | supervise the use of advanced personal and collective protective equipment | initiate actions aimed at using innovative personal and collective protective equipment | conduct research on the effectiveness of innovative personal and collective protective equipment in various work environments |
| | | | list the impact of mining tasks | determine the cause of the impact of mining tasks | determine the methods for assessing and determining the scope of the impact of mining tasks | select the methods and techniques of measuring impact | diversify mining methods and techniques to reduce impact | use computer programs to monitor and forecast the impact of mining tasks on the surrounding environment |
| | | | install ventilators, air-conditioning, explosion-proof barriers and methane extraction systems* | supervise the installation of ventilators, air-conditioning, explosion-proof barriers and methane extraction systems* | supervise the construction of explosion-proof barriers, especially during rescue operations* | design the construction of ventilators, air-conditioning, explosion-proof barriers, methane extraction systems as well as ventilation and insulation brattices* | critically assess the installation of ventilators, air-conditioning, explosion-proof barriers, methane extraction systems as well as ventilation and insulation brattices under conditions of multiple hazards* | forecast the gas and climate conditions in a ventilation network and select innovative technologies to improve them* |
| Decommissioning work | Knowledge (knows and understands) | All determinants | **III.K.R.L3** | **III.K.R.L4** | **III.K.R.L5** | **III.K.R.L6** | **III.K.R.L7** | **III.K.R.L8** |
| | | | the sequence of the work to be performed in decommissioning headings | the significance and procedures of the work to be performed in decommissioning headings | the specialised work of decommissioning headings | the methodology of performing the operations and tasks of decommissioning a mining plant | the methods of selecting the decommissioning operations and tasks depending on geological and mining conditions | the advanced methods of decommissioning headings and mining plants taking into account the economic aspect |
| | | | the concept of post-mining reclamation | the directions of post-mining reclamation | the criteria for selecting the directions of post-mining reclamation | the methods of assessing the fitness of land for post-mining reclamation | the concept and benefits of post-mining reclamation | the methods of conducting social dialogue at the stage of decommissioning and post-mining reclamation |
| | | | the basic issues involved in using decommissioned mining plants or their structures for power generation as well as for the storage and production of heat and/or cold energy | the advanced issues involved in using decommissioned mining plants or their structures for power generation as well as for the storage and production of heat and/or cold energy | the advanced methodology of using decommissioned mining plants or their structures for power generation as well as for the storage and production of heat and/or cold energy | the advanced methodology of using decommissioned mining plants or their structures for power generation as well as for the storage and production of heat and/or cold energy, by applying engineering tools for these purposes | the advanced methodology of using decommissioned mining plants or their structures for power generation as well as for the storage and production of heat and/or cold energy, by applying advanced tools for these purposes | the advanced methodology of using decommissioned mining plants or their structures for power generation as well as for the storage and production of heat and/or cold energy, by applying innovative tools for these purposes |
| | | | the machines and tools used for decommissioning headings and mining plants | the technologies for performing decommissioning work | the factors influencing the choice of the technology for decommissioning headings and mining plants | the criteria for assessing the technology of decommissioning headings and mining plants | the tools for assessing alternative technological solutions for decommissioning headings and mining plants | the innovative methods of selecting and assessing the technical and technological solutions for decommissioning headings and mining plants |
| | | | the methods of decommissioning headings and mining plants and the scope of decommissioning work | the natural and technical hazards occurring when decommissioning headings and mining plants | the principles of organising decommissioning work | the principles of preparing technical designs for decommissioning headings and mining plants | the procedures to be followed in the event of complications occurring during decommissioning work | the innovative methods of decommissioning headings and mining plants |

| Context | Category | Determinant | Level 3 | Level 4 | Level 5 | Level 6 | Level 7 | Level 8 |
|---|---|---|---|---|---|---|---|---|
| Decommissioning work | Skills (is able to) | All determinants | **III.S.R.L3** | **III.S.R.L4** | **III.S.R.L5** | **III.S.R.L6** | **III.S.R.L7** | **III.S.R.L8** |
| | | | — | list the factors influencing the scale and scope of decommissioning tasks | characterise the factors influencing the scale and scope of decommissioning tasks | determine the matrix of the influence of various factors on the scope of decommissioning tasks | apply innovative methods of decommissioning headings and mining plants | critically assess the proposed solutions for decommissioning headings and mining plants |
| | | | — | — | — | adjust the scope of decommissioning tasks to existing natural hazards | forecast the impact of performed decommissioning tasks on the occurrence of natural hazards | model the impact of decommissioning tasks on the occurrence of multiple natural hazards using computer tools |
| | | | perform the work of decommissioning headings and mining plants | supervise and organise the work of decommissioning headings and mining plants | perform and supervise specialised work for decommissioning headings and mining plants | organise specialised work for decommissioning headings and mining plants | optimise the organisation of specialised work for decommissioning headings and mining plants using IT tools | — |
| | | | understand the graphic part of a reclamation project | prepare the graphic part of a reclamation project | prepare the text part of a reclamation project based on legal regulations and industry standards | supervise the preparation of a reclamation project | prepare a cost estimate for decommissioning based on a reclamation project | use research methods to economically optimise a reclamation project |
| COMPLIANCE WITH RULES: conditions, instructions, law | Social competence (is ready to) | All determinants | **a.C.R.L3** | **a.C.R.L4** | **a.C.R.L5** | **a.C.R.L6** | **a.C.R.L7** | **a.C.R.L8** |
| | | | solve current and straightforward problems in cooperation with a group | maintain dialogue and cooperation, comply with superiors and their instructions and ensure that subordinate employees follow these instructions | maintain dialogue and cooperation within an assigned small team, comply with superiors and their instructions and ensure that subordinate employees follow these instructions | maintain proper relations in the professional community (constructive conflict resolution) | critically assess the information received; recognise the importance of knowledge in solving cognitive and practical problems | — |
| | | | report reliably on matters concerning the performance of tasks ordered by a superior | solve current problems in cooperation with a group of co-workers | maintain dialogue and solve current conflicts and problems in cooperation with an assigned small team of subordinate employees | maintain dialogue and cooperation with subordinate teams, comply with superiors and their instructions and ensure that one's subordinate team follows these instructions | encourage and organise activities involving the social community; initiate activities for the public interest; think and act in an entrepreneurial manner | — |
| | | | comply with the arrangements for cooperation in the performance of professional tasks | comply with the principles of loyalty to the employer and co-workers | comply with the principles of loyalty to the employer, co-workers and subordinates | responsibly fulfil one's professional roles taking into account changing social needs, including: maintaining the professional ethos, developing standards of professional ethics and taking action to observe these principles | responsibly fulfil one's professional roles taking into account changing social needs, including: developing professional achievements and maintaining the professional ethos, developing standards of professional ethics and taking action to observe these principles | --- |
| | | | take professional and civil responsibility for the consequences of one's actions and decisions | assess the work one performs as well as the work of one's subordinate team | assess the work one performs as well as the work of one's subordinate team and take responsibility for its execution | perform mining activities taking into account the rational management of natural resources | perform mining operations using the latest research results and innovative solutions | develop innovative solutions for conducting mining operations and publish the results of one's research work |
| | | | reliably perform entrusted professional tasks | monitor the quality of the tasks performed by subordinate employees | control the quality of the tasks performed by subordinate employees and take responsibility for managing small teams of employees | control the quality of the tasks performed by subordinate employees and take responsibility for managing large teams of employees | require employees and subordinates to comply with the rules in force on maintaining the quality of the performed activity as well as a culture of cooperation | — |
| | | | comply with basic safety rules adequate to the risk of natural hazards | comply with the principles of maintaining one's own health and safety as well as that of other persons given the risks arising from natural hazards | comply with the principles of maintaining one's own health and safety as well as that of other persons given the risks arising from the natural and technical hazards of working with machines and equipment | comply and implement the principles of maintaining one's own health and safety as well as that of other persons given the risks arising from the natural and technical hazards of working with machines and equipment | develop health and safety principles and work towards compliance with these principles | develop and model health and safety principles for various natural hazards |
| | | | take responsibility for entrusted technical measures | take responsibility for autonomously performed professional tasks | apply and promote ethical principles in the course of professional activities taking into account the quality, economic and social contexts of the responsibility associated with professional activities | participate in a culture promoting quality in professional activities | promote a culture of quality in professional activities and make decisions in high-risk situations | model a culture promoting quality in professional activities |

| Context | Category | Determinant | Level 3 | Level 4 | Level 5 | Level 6 | Level 7 | Level 8 |
|---|---|---|---|---|---|---|---|---|
| COOPERATION: Communication and relations in the professional community | Social competence (is ready to) | All determinants | **b.C.R.L3** | **b.C.R.L4** | **b.C.R.L5** | **b.C.R.L6** | **b.C.R.L7** | **b.C.R.L8** |
| | | | apply simple rules of effective interpersonal communication, communicate in a way that does not interfere with the flow of information about the performed professional tasks | communicate in a way that effectively conveys information and instructions | communicate in a way that effectively conveys information and instructions during rescue operations | communicate in a way that effectively conveys information and instructions using modern means of communication | communicate in a way that effectively conveys information and instructions using modern means of communication with IT tools | communicate in a way that effectively conveys information and instructions using modern means of communication with innovative IT tools |
| | | | work in a team in accordance with one's job position, build good, healthy relationships regardless of one's role in the team | work in a team on the organisation and supervision of mining tasks | work in a team on the organisation and supervision of mining tasks during rescue operations | critically assess one's professional activities in the supervision of mining work and the results of teamwork | critically assess one's professional activities in the supervision of mining work and the results of teamwork using IT tools | critically assess and model one's professional activities in the supervision of mining work and the results of teamwork using innovative IT tools |
| | | | apply the principles of effective time management | apply the principles of effective time management with subordinate employees | apply the principles of the effective time management with subordinate employees during rescue operations | critically assess the principles of effective time management of subordinate employees | critically assess the principles of effective time management of subordinate employees using IT tools | model the principles of the effective time management of subordinate employees using innovative IT tools |
| | | | share knowledge and experience | willingly and consistently help others by sharing one's knowledge and experience even in difficult and complex situations | act as a mentor for others | teach others how to be an effective mentor for others | manage systems that enable the sharing of knowledge and experience | introduce systems that encourage the sharing of knowledge and experience |
| | | | accept corrective feedback concerning unwanted behaviours and attitudes | accept corrective feedback and use it effectively as an aid to one's development and continuous improvement | provide corrective feedback concerning unwanted behaviours and attitudes in a constructive manner, i.e. with respect and dignity | effectively provide corrective feedback concerning unwanted behaviours and attitudes, i.e. with respect and dignity even when the group is resistant | establish a corporate culture that encourages providing corrective feedback concerning unwanted behaviours and attitudes in a constructive manner, i.e. with respect and dignity | teach others how to constructively provide corrective feedback concerning unwanted attitudes and behaviours |
| | | | accept a positive assessment of the results of one's work | express appreciation and recognition for the results of work | motivate by expressing appreciation for the results of work | use non-financial methods of motivation in team management | implement systemic non-financial methods of motivation | teach others non-financial methods of motivation |
| | | | cooperate with others | cooperate with others even in situations of differing views, opinions | manage cooperation in a subordinate team | manage cooperation in subordinate teams and interdisciplinary teams developed for the duration of a given activity or project | teach others to cooperate effectively | establish a corporate culture focused on the value of cooperation |
| | | | — | understand the concept and significance of stakeholders | maintain good relations with stakeholders | build and maintain good relations with stakeholders, with particular emphasis on key stakeholders | introduce standards for building and maintaining good relations with stakeholders | introducing systems for building and maintaining good relations with stakeholders, with particular emphasis on key stakeholders |
| | | | — | — | meet customers' expectations | be open to customers' expectations and promote solutions that meet those expectations | be open to customers' expectations and develop solutions that meet those expectations | be open to customers' expectations and develop innovative solutions that meet those expectations |
| | | | — | — | — | accept failures and draw constructive conclusions from them | accept failures, draw constructive conclusions from them and develop corrective actions | accept failures, draw constructive conclusions from them, develop corrective actions and assess their effectiveness |
| RESPONSIBILITY: Ethical standards | Social competence (is ready to) | All determinants | **c.C.R.L3** | **c.C.R.L4** | **c.C.R.L5** | **c.C.R.L6** | **c.C.R.L7** | **c.C.R.L8** |
| | | | act in accordance with basic ethical principles of the professional community, act honestly and in accordance with one's values | take innovative actions in accordance with ethical principles and safety regulations in force in the mining industry | responsibly fulfil one's roles resulting from the scope of one's duties, including compliance with the principles of professional ethics | be innovative and creative and accepting of solutions that improve the efficiency and effectiveness of performed tasks | develop standards, principles and procedures during the performance of tasks that guarantee quality, effectiveness and safety | — |
| | | | care about the quality of the performed work | care about the quality of one's own performed work and that of others | manage the quality of performed activities | manage the quality of performed activities even under time pressure and with limited resources | teach others to manage the quality of their work | develop a corporate culture focused on the quality of performed work |
| | | | achieve the expected results of short-term objectives | achieve the expected results of medium-term objectives | achieve the expected results of long-term objectives | achieve the expected results, which requires coping with the adversities arising in the process of reaching the objective, taking steps to ensure that the results are at the highest level possible | perform extremely difficult objectives, tasks and deliver results even in very difficult, complex and unclear situations, which may seem unrealistic to most employees | mobilise oneself and others to achieve complex aims |

| Context | Category | Determinant | Level 3 | Level 4 | Level 5 | Level 6 | Level 7 | Level 8 |
|---|---|---|---|---|---|---|---|---|
| RESPONSIBILITY: Ethical standards | Social competence (is ready to) | All determinants | implement new solutions, be open to change, solve emerging problems | initiate simple changes that increase work effectiveness, implement innovations and improvements | manage change – implement new solutions to improve the effectiveness of processes | treat change as an important and natural element of self-development and company development, convince others about this | teach others how to effectively implement change | develop an organisational culture open to change and continuous improvement |
| | | | learn new solutions | learn continuously about new solutions and use different sources of available knowledge | motivate others to learn continuously about new solutions – continuous improvement | — | develop new solutions | inspire others to implement new solutions |
| | | | work under pressure | — | work under pressure and cope with crisis situations | work under pressure, cope with and make decisions in crisis situations | work under pressure, cope with and make decisions in crisis situations, support one's colleagues in difficult moments | work under pressure, cope with crisis situations and support one's colleagues in difficult moments |
| | | | — | — | — | involve and motivate task team members, regardless of their role in the team | — | — |
| | | | — | take the initiative to implement ideas | — | become involved in the development of task team members | — | — |
| | | | — | not settle for the status quo and seek out opportunities for improvement and innovation | — | present concepts and ideas in an engaging manner | — | — |
| | | | — | find and combine various ideas, concepts and data, perceive the connections between seemingly different aspects | — | make bold decisions, even if they are unpopular or break with standard practice | — | — |

* only applies to underground mining

The Sectoral Qualifications Framework for the Mining Sector (SQFM) is a tool to support mining industry employers and employees in developing professional competence. It is a structured set of competences associated with the main areas of work and business activity in the sector. The proposed SQFM can be used by mining sector companies to streamline personnel processes and make it easier for employees to determine their own career and learning paths. It can also help education and training institutions in preparing educational programmes.

The publication contains information describing the proposed Sectoral Qualifications Framework for the Mining Sector and the process of its development, including: the context of its initiation, project description and methodology, its structure, instructions for using the framework, recommendations for its implementation and use in Poland, as well as explanations of the terminology used. The results of surveys among employees on the use of competences in mining plants are also presented.

SQFM was developed by a team of experts representing various mining sector entities. The work was coordinated by a consortium of AGH University of Science and Technology and JSW Training and Mining. The foreword to the publication was written by Dr. Adam Mirek, President of the State Mining Authority.

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