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The multi-raw material documentation as the basis for a comprehensive and rational use of mineral deposit resources on the example of the area of the Bełchatów lignite deposit

Introduction

The mineral deposits are the basic source of mineral resources and due to their non-renewable nature and increasingly difficult conditions of acquisition, they require economical management. In the modern understanding of mineral deposit management, it is not only about the use of the main mineral and accompanying minerals but also about other rocks and sediments present in the deposit area. It is proposed to introduce the requirement to identify and document the full range of minerals in terms of multi-components in the concession

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procedures. The currently binding legal regulations include the principles of comprehensive and rational documentation and mineral extraction, but despite the legal rigors and possible financial benefits. Thus, the present-day regulations are not satisfactory.

In recent years, the aforementioned issue has returned to the discussion forum and concerns not only the formal prospecting, documentation and extraction of minerals from deposits but also the raw material. The publications of Stefanowicz (Stefanowicz 2018), Nieć et al. (Nieć et al. 2018) and Szamałek et al. (Szamałek et al. 2019) should be mentioned as they are representative of this discussion. Dziadzio (Dziadzio 2022) emphasized the problem of multi-commodity documentation of deposits, referring it to documenting in category D without specifying what mineral is taken into account. One of the reasons for the insufficient use of mineral deposit resources is the law. However, it includes the licensing procedures as well as the principles of the raw material policy, especially those regarding the economic and financial aspects.

When talking about the rational use of minerals, especially in the case of opencast deposits, environmental conditions cannot be ignored (Ptak 2019). The scope of this problem and the related legal regulations from the point of view of multi-raw material documentation are of particular importance in the case of minerals for which the raw material suitability is questionable but can be successfully used for land reclamation after mining operations have ended.

1. Comprehensive and rational management of mineral deposits in light of the applicable law

The mineral deposits are a component of the rock mass and the environment, so they are protected under the Act of April 27, 2001 (Act 2001) Environmental Protection Law (EPL). Article 125 of this act states that "mineral deposits are subject to protection consisting in rational management of their resources and comprehensive use of minerals, including accompanying minerals." The requirement for the comprehensive and rational use of mineral deposits is presented in detail in the provisions of the Act of June 9, 2011 (Act 2011) Geological and Mining Law (GML), as amended, with regard to the prospecting, appraisal and documentation of deposits and the extraction of minerals. Articles 21 and 26 of the GML (Act 2011), concerning the content of concession applications, emphasize the need to take into account accompanying minerals and co-occurring useful trace elements in addition to the main mineral. Article 89 of the GML (Act 2011) requires that the geological documentation of a mineral deposit specifies the type, quantity and quality of the mineral, providing information on accompanying and co-occurring minerals and trace elements including those that are useful and those that are harmful. In subsequent articles relating to the extraction of minerals from the deposit, the act (Act 2011) requires that the mining plant operation plan specifies the undertakings necessary to ensure the rational management of the deposit. The GML (Act 2011) also provides for the possibility of controlling the rational management

of a mineral deposit by the mining supervision authority. In order to implement the guidelines contained in the act (Act 2011) on the management of mineral deposits, the following regulations were issued:

1. Regulation of the Minister of the Environment of July 1, 2015 on the geological documentation of a mineral deposit, excluding hydrocarbons (Regulation… 2015). This regulation requires providing information on the main mineral and the accompanying minerals as well as co-occurring trace elements, including the characteristics of technological properties of minerals and the possible directions of their use.
2. Regulation of the Minister of the Environment of April 24, 2012 on the detailed requirements for deposit development projects (Regulation… 2012a). The regulation requires defining the optimal variant of the use of resources in the Deposit Development Project (DDP), in particular through the comprehensive and rational use of the main mineral and accompanying minerals. The DDP should also specify the degree of accompanying and co-occurring mineral resources use.
3. Regulation of the Minister of the Environment of February 16, 2012 on mining plant operation plans (Regulation… 2012b). The mining plant operation plan refers to the extraction stage and, in accordance with the regulation, should include the degree of resource utilization, including the resources of associated mineral deposits and the determination of projects aimed at the comprehensive and rational use of the main mineral and accompanying minerals.
4. Regulation of the Minister of Economy of April 8, 2013 on detailed requirements for opencast mining operations (Regulation… 2013). The regulation requires that in the scope of geological services for a mining plant, rational use of minerals should be controlled and periodic analyses of deposit management should be performed.

It should be additionally noted that for the purposes of analyzing the management of mineral deposits in opencast mining plants, the State Mining Office developed standard procedures (The standards… 2012). These standards define the framework of supervision and control procedures by mining supervision authorities in the field of mineral deposit management in relation to the applicable provisions of the Geological and Mining Law. They have been specified for individual stages of deposit management:

- at the stage of operation planning;
- at the stage of mineral extraction;
- at the stage of liquidation of the mining plant.

Detailed guidelines for the comprehensive and rational use of mineral deposits are included in the "Principles of documenting solid mineral deposits," issued by the Environment Ministry in 2002 (The principles… 2002). This document defines terms in the field of mineral deposit management, such as: main mineral, accompanying minerals, mono-mineral and multi-mineral as well as multi-mineral and multi-raw material. When analyzing the specified definitions, it should be noted that the term "multi-mineral deposit" refers to a deposit

consisting of two or more minerals of similar economic or utility value, occurring in such a way that their exploitation is possible in one mining plant. The minerals forming a multi-mineral deposit correspond to the proposal of Wyrwicki (Wyrwicki 2002) to call them co-occurring minerals. It seems that limiting the scope of the multi-mineral deposit concept to co-occurring minerals is too narrow. It would be appropriate to include the term "multi-mineral deposit" in deposits in which the main mineral, co-occurring and accompanying minerals are present. The term "multi-mineral deposit" defined in this way would correspond to the definition contained in the principles… (2002), that is, "natural accumulation of a mineral or several minerals that may be the subject of exploitation." The modification of the term "multi-mineral deposit" is justified in the context of the problem of using the resources of the Bełchatów lignite deposit discussed in this article.

The basis for the comprehensive and rational use of deposits is to determine the raw material suitability of minerals. In the lithological profile of deposits, there are also usually rocks, sediments or substances that do not qualify as minerals but show some utility values. Limiting the research only to the assessment of the usefulness of raw materials removes the possibility for the full use of the extracted minerals, especially the deposits exploited using the opencast method, in which it is necessary to remove the entire overburden. For example, in the area of the Bełchatów lignite deposit, overburden sediments unsuitable for raw material purposes are mined. They are deposited on heaps and can therefore be used during the reclamation of excavations after lignite mining is completed. An even better example are waters from mine drainage, which according to the GML (Act 2011), are not a mineral, but were and still are applied for technological purposes, and sometimes (e.g. in the Bełchatów and Konin mines) for the production of drinking water and fruit drinks. Therefore, it is recommended to fully characterize deposits, both in terms of raw material and non-raw material suitability (The principles… 2002). In addition, during the exploration and documentation of the deposit intended for opencast mining, the quality of all minerals occurring between the land surface and the roof of the main mineral and directly below its floor, as well as in the adjacent sediments/rocks, should be investigated. The liquid and gaseous minerals, including drinking and industrial waters, should also be studied to the extent that allows the assessment of their possible use after the start of exploitation.

In the practice of documenting deposits and conducting exploitation, the concept of comprehensiveness and rationality does not go beyond the scope provided for by the provisions of the above cited laws and regulations. Only in some cases does it include rocks, sediments or substances other than the main and accompanying minerals. However, such cases are not common. The possibility of improving the use of mineral resources is seen in the improvement of legal regulations, for example, through the introduction of concessions for multi-raw materials.

2. The multi-mineral nature of the Bełchatów lignite deposit

Domestic lignite deposits, including the Bełchatów deposit, are classified as multi-mineral varieties (Gruszczyk 1983). This means that, apart from the main mineral (lignite), they contain different types of non-lignite sediments and rocks. For a long time, they were inaccurately called waste. Some of them, due to the demonstrated properties of raw materials, gained practical interest. The presence of accompanying minerals in the lithostratigraphic profile of the Bełchatów lignite deposit was mentioned in the first geological documentation from 1964 (Geological Documentation… 1983). Problems of both a technical and operational nature, as well as formal and legal problems, have prevented their use. The former primarily concerned knowledge of the geological and mining conditions of the deposit causing operational difficulties or recognition of the properties of raw materials and determining their resources. The second concerned the economic premises justifying the advisability of their extraction, processing and use. In order to solve these problems, it became necessary to introduce regulations covering mining and economic issues, enabling them to be treated as accompanying minerals. In such circumstances, their selective exploitation has begun. Initially, the amounts of selectively mined accompanying minerals from the Bełchatów lignite deposit were at trace levels. Over time, they reached a high level of exploitation, for example, they amounted to over 1.2 million Mg in 1996. In recent years, however, the volume of these minerals being extracted has been stable and ranges from 400 to 800 thousand Mg (Adamczyk et al. 2012; Figure 1).

The accompanying minerals are extracted selectively and transported by belt conveyors to landfill, the so-called secondary deposits. They are then managed in a raw state or processed in the aggregate processing plants in the village of Chabielice, which is located near the Szczerców opencast – one of the two opencasts belonging to the Bełchatów Lignite Mine.

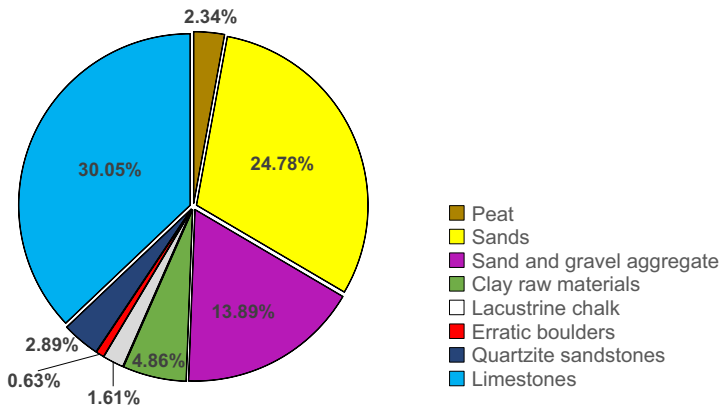

Fig. 1. Extraction of accompanying minerals in the Bełchatów Lignite Mine (Stobecki et al. 2023)

Rys. 1. Wydobycie kopalin towarzyszących w Kopalni Węgla Brunatnego Bełchatów

2.1. Geological conditions of the occurrence and lithological character of the accompanying minerals

Documentation of the accompanying minerals should be performed as early as the stage of deposit exploration. This would allow the geological structure of the deposit to be verified on an ongoing basis and would enable better forecasting of any threats that may appear during the mining of the main mineral, lignite. The manner and form of the occurrence, and thus the lithological character of the accompanying minerals, primarily depend on the morphogenic type of lignite deposits. They can take the form of a bed or lens or another form interbedded with the main mineral (i.e. lignite). Consequently, the accompanying minerals may occur in the roof or floor of a lignite seam or may be located at a greater or lesser distance from it (Nieć 1994; Figure 2).

Associated mineral deposit type		The occurrence accompanying mineral method in relation to the main mineral	Examples	Main mineral / Accompanying mineral / Barren rocks / Operating level limit
Layering		INTERBEDDINGS AND INTERGROWTHS IN THE MAIN MINERAL DEPOSIT	CLAY INTERGROWTHS AND LACUSTRINE CHALK INTERBEDS	
Adhering	IIa	ADJACENT IN ROOF OR FLOOR OF THE MAIN MINERAL IN HORIZONTALLY ARRANGED DEPOSIT	CLAYS AND SANDS	
	IIb	ADJACENT IN ROOF OR FLOOR OF THE MAIN MINERAL IN STEEPLY ARRANGED DEPOSIT	CLAYS AND SANDS	
	IIc	ADJACENT TO THE MAIN MINERAL DEPOSIT ALONG DISCONTINUITY BOUNDARIES (TECTONIC, EROSIVE, WEATHEREING)	CLAYS, LACUSTRINE CHALK	
Not adhering	IIIa	NOT ADJACENT TO THE MAIN MINERAL LOCATED CLOSE	CLAYS, MINERAL AGGREGATE	
	IIIb	NOT ADJACENT AND DISTANT FROM THE MAIN MINERAL	ZECHSTEIN SALTS, ERRATIC BOULDERS, MESOZOIC LIMESTONES, LACUSTRINE CHALK	

Fig. 2. Geological and mining classification of accompanying minerals (Nieć 1994; slightly changed)

Rys. 2. Geologiczno-górnicza klasyfikacja kopalin towarzyszących

The accompanying minerals occurring in Polish lignite deposits are mainly represented by Cenozoic sediments and less often by Mesozoic sediments. The lithological character of the Cenozoic sediment (predominantly of Neogene age) is varied. They were formed in freshwater sedimentary reservoirs, mainly in river valleys, representing various morphological river types (braided, meandering and/or anastomosing), as well as in lakes and mires (Ratajczak et al. 2017b; Hycnar et al. 2021, 2022; Widera 2021; Widera et al. 2021, 2022). As a result, in the Neogene part of the lignite deposit area, the accompanying minerals are predominantly loose or poorly cemented. These include granulometrically diverse silts, sands and gravels with plastic sediments of loams and clay of different mineral composition. A similar type of accompanying minerals is represented by sediments or rocks classified as Quaternary. In their case, apart from loose, poorly cemented or plastic sediments, random boulders appeared in the Pleistocene as a remnant of the successive Scandinavian glaciations, which differ from the above-mentioned Neogene accompanying minerals primarily in terms of their lithological character but also their origin (Ratajczak et al. 2017b; Hycnar et al. 2022).

The accompanying minerals of Mesozoic age in the area of the Bełchatów lignite deposit mainly consist of petrographically diverse limestone. Later, there were variable physical and chemical conditions in the lignite-bearing sedimentary basin. The processes of accompanying mineral formation and their transformations, occurring at the stage of dia- and epigenesis, led to the creation of sediments or rocks of a completely different lithological character among the Cenozoic formations. These are called hard-to-mine rocks because their high compactness and hardness, as well as unpredictable occurrence in the lithostratigraphic profile, cause great exploitation difficulties. Therefore, they must be mined selectively. The changing physical and chemical conditions are also responsible for the presence of other types of rocks, sediments and mineral substances in the area of the lignite deposit. These include kaolins, quartz sands, lacustrine chalks, bog iron ores, peats, mine waters and gases. They usually occur locally, in small or even trace amounts, which is why they are called "niche" (Ratajczak et al. 2017b).

The works that were conducted for several decades in the study area were first related to the documentation of the Bełchatów lignite deposit and then its access and exploitation. At that same time, the lithological character and properties of the accompanying raw minerals were recognized (Geological Documentation… 1983; Adamczyk et al. 2012).

The accompanying minerals together with their resources occurring in the area of the Bełchatów lignite deposit are presented in Table 1. The terminology used in their case does not always correctly define their lithological and petrographic nature, sometimes referring to the raw material properties. The accompanying minerals occur within all Neogene lithostratigraphic complexes; these are sub-coal, coal, sand-coal and clay-sand (Geological Documentation… 1983; Adamczyk et al. 2012). Some Quaternary and Mesozoic deposits also meet the criteria for accompanying minerals. Wiśniewski (Wiśniewski 2000) stated that there are twenty-one types of sediments/rocks in the area of the Bełchatów lignite deposit, which can be classified as accompanying minerals. Nevertheless, this forecast turned out

Table 1. Some varieties of accompanying minerals from the area of the Bełchatów lignite deposit according to geological documentation from 1964 (Geological Documentation… 1983), including resources*

Tabela 1. Niektóre odmiany kopalin towarzyszących z obszaru złoża węgla brunatnego Bełchatów według dokumentacji geologicznej z 1964 r.

Mineral type	Resources
Sands for liquid backfill	11.3 million m^3
Sand and gravel mixes	2.5 million Mg
Building sands	42.5 million Mg
Clays for cement production	5.2 million Mg
Clays for the production of building ceramics	38.5 million Mg
Lake chalk	13.8 million Mg
Quartz sands	3.0 million m^3

to be too optimistic. Detailed geological and raw material studies have shown that some of them do not meet the criteria defined in the meantime, characterizing accompanying minerals.

2.2. Raw materials of accompanying minerals

The three types of accompanying minerals from the area of the Bełchatów lignite deposit were distinguished in the geological and raw material studies. These are as follows:

- multi-raw materials;
- hard-to-mine rocks;
- other.

The first group includes varieties with the most interesting, sometimes even specific, raw material properties used in both industrial technologies and environmental protection. These accompanying minerals are beidellite clays, lacustrine chalk, Mesozoic limestones, Pleistocene sands and gravels (Ratajczak et al. 2017a; Stobicki et al. 2023).

The beidellite clays can be used for the production of building ceramics, the production of ceramic facade tiles, in drilling (the production of drilling fluid), the waterproofing of landfills, soil reclamation and the production of expanded clays. They also have physical and chemical properties that allow them to be treated as sorbents of pollutants, especially liquid pollutants (Ratajczak et al. 2017b).

The lacustrine chalk in the Bełchatów lignite deposit occurs in three lithological varieties – mainly white and dark (with a significant content of lignite), and to a lesser extent silicified. The varieties are not mined separately. Therefore, on anthropogenic deposits,

it is the carbonaceous (coaly) chalk with a high content of coalified plant material, which is called lignite detritus (Widera 2021). The lacustrine coaly chalk is mainly used as an agricultural fertilizer. The usefulness of this mineral has also been demonstrated for the production of white cement, burnt lime and technical chalk. However, its sorption properties are particularly interesting, which enables the application of coaly chalk as a SO_2 sorbent in fluidized-bed combustion technology (Hycnar et al. 2021).

The Mesozoic limestones are the raw material for the production of crushed aggregate applied in road construction. This aggregate is used both for the mine's own needs to build service roads and sold to external recipients. Initially, the described limestones were applied only for the production of the above-mentioned aggregate. In recent years, the leading direction of the utilization of these rocks has been the production of fine-grained sorbents for the needs of the wet desulphurization technology at the Bełchatów Power Plant (Ratajczak et al. 2017a; Hycnar et al. 2021, 2022).

Pleistocene sands and gravels are also an example of multi-raw materials. They are usually washed if they contain numerous clay and mud layers. They are then sieved and sorted, which enables obtain sands and aggregates to be obtained with a wide range of applications. They are not only used for land levelling or earthworks aimed at improving the stability of the slopes of the external heaps, they are also applied in anti-corrosion works, in foundries in the building industry and for the production of adhesives and building mortars. They can also be used as a basic component in the production of sand-lime bricks as well as for water purification and treatment (Ratajczak et al. 2017b).

The hard-to-mine rocks in the area of the Bełchatów lignite deposit are represented by erratic boulders and ferruginous sandstones found in the Quaternary sediments, silica sandstones and conglomerates present in the Neogene part of the lithostratigraphic profile and Mesozoic limestones. In most cases, these rocks are exploited with the use of explosives and are then crushed, screened, sorted and, if necessary, washed at the Aggregates Processing Plant (located in the aforementioned village of Chabielice) to obtain crushed aggregates. In the case of Mesozoic limestones, the rock material is additionally segregated. As a result, the limestones of high hardness (for which the Bond work index is over 12 kWh/Mg) is used in the form of aggregate. If they are not as hard as those mentioned above, they do not meet the requirements for limestones intended for grinding. In general, the aggregates are used for the mine's own requirements and are sold to external recipients (Hycnar et al. 2022). Thus, the Bełchatów Lignite Mine turned from a customer into a producer of this type of raw material.

Among the varieties of accompanying minerals occurring in the area of the Bełchatów lignite deposit, there are those that are characterized by an individual form of occurrence and specific raw-material properties. They include both solid minerals, as well as liquid and gaseous mineral substances. Their occurrences are small in terms of resources. They include clay sediments, such as kaolins, paratonsteins, varved clays, and additionally quartz sands and peats. Moreover, they also include various liquid and gaseous substances, namely, mine waters and gases.

The presented division of the accompanying minerals occurring in the area of the Bełchatów lignite deposit is important for at least two reasons:

1. Some of them are multi-raw materials. This determines the need for a comprehensive use of deposit resources in the case of this type of their occurrences.
2. Beidellite clays, lacustrine chalk and limestones are minerals with sorption properties. They can be applied in environmental protection technologies utilised in the energy industry (beidellite clays as sorbents for heavy metals and petroleum substances or as waterproofing barriers in fly ash landfills; lacustrine chalk and limestone as sorbents in desulphurization technologies). The pro-ecological possibilities of using these accompanying minerals are in line with the formula formulated by Walery Goetel's principle "...what the industry has destroyed, it should repair...".

3. Management of accompanying minerals in the Bełchatów Lignite Mine

The creation of opportunities to use accompanying minerals is one of the priority deposit and raw material issues implemented by the Bełchatów Lignite Mine from the beginning of its operation. The undertaken activities cover both scientific and research issues, as well as organizational issues. In the first case, works of a geological, deposit and raw-material nature are undertaken. They consist of the determination of the geological and mining conditions for the occurrence of accompanying minerals, estimating resources, recognizing the lithological, mineralogical and petrographic nature, chemical composition, as well as raw-material properties. The aforementioned activities also include cartographic works, the profiling of borehole cores, sampling and a wide range of laboratory tests. The results of these works constitute the content of geological documentation and subsequent additions to it (e.g. Geological Documentation… 1983). Taking them into account, the mining services make many operational decisions regarding the current operation of the mine and the rational management of deposit resources (Stobecki et al. 2023). The results obtained and the decisions made became the basis for creating:

- The Unified Geological Database that collects geological, deposit and raw material information on particular types of accompanying minerals. This enables the selection of the most favorable types of minerals in terms of raw material properties for detailed research and possible exploitation. Moreover, the Unified Geological Database is very useful during mining and exploitation works.
- Anthropogenic deposits guarantee the protection of mineral resources against their irretrievable loss. Simply, they constitute a reservoir of minerals, which is a raw-material base for the implementation of various investments in the future.

The Bełchatów Lignite Mine has developed a new approach to the issue of accompanying minerals. This consists in:

- Creating the exploitation points. This means selecting points for possible exploitation and using fragments of lithostratigraphic complexes as raw materials within which the accompanying minerals occur.
- Establishing an organizational unit within the structure of the mine dealing with the issues of accompanying minerals. Initially, this was the Accompanying Minerals Activation Department, which was then transformed into the Overburden and Accompanying Minerals Section. The result of their activities was, among others, the development of "Procedures for the exploitation and development of accompanying minerals" as well as the "Control of protection against destruction of accompanying minerals and the possibility of their use".
- Implementing work plans for excavators, including information on the areas of the occurrence of accompanying minerals, the manner of their storage and the resources to be extracted.

The procedures responsible for the comprehensive management of accompanying minerals implemented in the case of the Bełchatów lignite deposit are presented in Figure 3. They made it possible to develop solutions for rational management of accompanying minerals, and in the case of hard-to-mine rocks, to additionally propose methods for their exploitation.

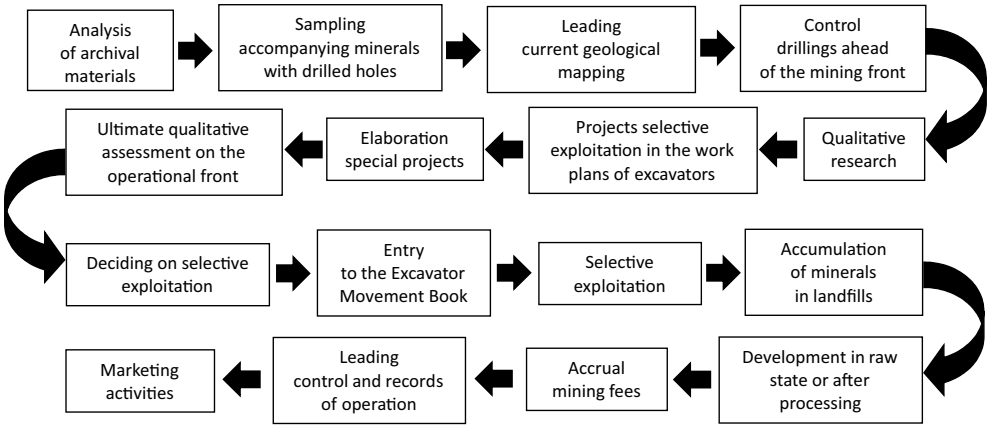

Fig. 3. Procedure of the extraction and development of accompanying minerals (Adamczyk et al. 2012)

Rys. 3. Procedury eksploatacji i zagospodarowania kopalin towarzyszących

Conclusions and proposed solution

Based on the analysis of the legal status regulating the management of domestic (Polish) mineral deposits in terms of the comprehensive and rational use of their resources, it can be concluded that much attention is paid to the main minerals and only partially to the accom-

panying minerals. In addition, the need to identify the non-resource usefulness of sediments, rocks and substances occurring in the lithological profile of the deposit is insufficiently emphasized.

From the results of many years of research and exploitation in the Bełchatów Lignite Mine, it can be concluded that this is an example of a multi-mineral deposit. Such a situation provided a lot of experience in the documenting and exploitation of both the main mineral, accompanying minerals and other components occurring in the lignite deposit area that are not solid minerals, namely mine waters and gases. Therefore, it seems reasonable to introduce a multi-raw material concession. In this situation, it is necessary to propose new formal and legal as well as economic and financial solutions that will be able to ensure a comprehensive and rational use of resources in the case of multi-mineral deposits. The hard-to-mine rocks should also be recognized at this stage. Moreover, in research on the possibilities of using accompanying minerals, more attention should be paid to their non-raw material usefulness, for example, for reclamation, environmental protection and slope stability.

The experience from the Bełchatów Lignite Mine clearly shows the need to legally sanction the status of anthropogenic deposits. Thus, it is postulated that the exploitation fee for accompanying minerals should be paid only after their sale. Finally, it is also recommended that the areas intended for the building of the anthropogenic deposits should be exempt from the taxation of economic activities. This will undoubtedly contribute to an increase in the degree of use of all accompanying minerals occurring in the area of the main mineral deposit.

This work was carried out in the statutory research of the Department of Mineralogy, Petrography and Geochemistry of AGH in Kraków (no. 16.16.140.315) and the Mineral and Energy Economy Research Institute of the Polish Academy of Sciences in Kraków.

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THE MULTI-RAW MATERIAL DOCUMENTATION AS THE BASIS FOR A COMPREHENSIVE AND RATIONAL USE OF MINERAL DEPOSIT RESOURCES ON THE EXAMPLE OF THE AREA OF THE BEŁCHATÓW LIGNITE DEPOSIT

Keywords

multi-mineral deposits, multi-raw material deposits, multi-mineral documentation, multi-raw material concessions, accompanying minerals

Abstract

The domestic (Polish) lignite deposits, including the Bełchatów deposit, are classified as multi-mineral and multi-raw materials. Ensuring the possibility of using a significant part of all minerals present in this type of deposits should be a matter of priority for mines. Over several dozen years of operation, the Bełchatów Lignite Mine, based on its own experience in documenting and exploiting both the main mineral and accompanying minerals, as well as rock mass components that are not solid minerals, this mine has developed a new approach to the problem of the comprehensive use of deposit resources. The content of the article is an attempt to answer the question: do the applicable laws guarantee a comprehensive and rational use of mineral deposits whose resources are non-renewable? On the example of the area of the Bełchatów lignite deposit, the comprehensive and rational use of mineral resources was analysed. It was indicated that the reasons for their use result from the lack of appropriate organizational, economic and financial solutions. Particular attention was paid to the need to modify the licensing procedures for prospecting, documenting and extracting minerals.

It seems reasonable to introduce multi-resource concessions, which are an important element of the circular economy. Therefore, proposals were formulated regarding the introduction of additional legal regulations and instruments of an economic and financial nature. These would be able to guarantee the comprehensive and rational use of most mineral resources.

WIELOSUROWCOWE DOKUMENTOWANIE PODSTAWĄ KOMPLEKSOWEGO I RACJONALNEGO WYKORZYSTANIA ZASOBÓW ZŁÓŻ KOPALIN NA PRZYKŁADZIE OBSZARU ZŁOŻA WĘGLA BRUNATNEGO BEŁCHATÓW

Słowa kluczowe

złoża wielosurowcowe, złoża wielokopalinowe, dokumentacje wielosurowcowe, koncesje wielosurowcowe, kopaliny towarzyszące

Streszczenie

Krajowe złoża węgla brunatnego, w tym również złoże Bełchatów, zalicza się do odmian wielokopalinowych i wielosurowcowych. Zapewnienie możliwości wykorzystania znaczącej części wszystkich kopalin występujących w tego typu złożach powinno być jednym z priorytetowych zadań realizowanych przez kopalnie. W czasie kilkudziesięciu lat funkcjonowania Kopalni Węgla Brunatnego Bełchatów, w oparciu o własne doświadczenia związane z dokumentowaniem i eksploatacją zarówno kopaliny głównej, jak i kopalin towarzyszących, a także składników górotworu, które nie są kopalinami stałymi, kopalnia ta wypracowała nowe podejście do problemu kompleksowego wykorzystania zasobów złoża. Treść artykułu jest próbą odpowiedzi na pytanie: czy obowiązujące przepisy prawa gwarantują kompleksowe i racjonalne wykorzystanie złóż kopalin, których zasoby są nieodnawialne? Na przykładzie obszaru złoża węgla brunatnego Bełchatów dokonano analizy kompleksowego i racjonalnego wykorzystania zasobów kopalin. Wskazano, że przyczyny niedostatecznego wykorzystania zasobów mineralnych wynikają z braku odpowiednich rozwiązań organizacyjnych, ekonomicznych i finansowych. Szczególną uwagę zwrócono na konieczność modyfikacji procedur koncesyjnych na poszukiwanie, dokumentowanie i wydobywanie kopalin. Racjonalne wydaje się wprowadzenie koncesji wielosurowcowych, które są ważnym elementem gospodarki w obiegu zamkniętym. Dlatego sformułowano propozycje wprowadzenia dodatkowych regulacji prawnych oraz instrumentów o charakterze ekonomiczno-finansowym. Będą one w stanie zagwarantować kompleksowe i racjonalne wykorzystanie większości zasobów mineralnych występujących w złożu.