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Managing value of decommissioning obligations in mining industry – key challenging issues from the financial reporting perspective

Introduction

A mine closure typically is not a financially viable undertaking *per se*. There are certain exceptions to this rule. They concern locations that are very attractive for specific non-mining activities, like quarries situated within big cities' boundaries which can be converted into recreational or residential sites, or former underground mines used for hydrocarbons or waste storage. But in most cases, mine closures are too expensive for self-financing. It is well established that primary responsibility for securing necessary means for the process in consideration belongs to a mining entrepreneur who had depleted underlying mineral resources and reaped related benefits. Mining had been the first industry to become a target of state and local regulations regarding decommissioning of assets and land rehabilitation. It was swiftly followed by the nuclear industry. Nowadays, a new wave of decommissioning processes has started, mostly related to PV power plants and wind turbines.

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The herewith presented article continues a series of papers dedicated to the evolution of theory and practice regarding closures of mining operations and decommissioning of related assets, following the opening paper titled: *Decommissioning of lignite mines in Poland – legal regulations regarding assurance of financial means* (Uberman and Naworyta 2025). It analyzes the development of financial disclosures in financial statements from both a regulatory and business perspective, focusing on issues pertinent to financial and accounting areas. It will be followed by at least two closely related papers which are under preparation. The first one will deal with challenges regarding planning, including budgeting closure activities. The second one will deal with warranties to be provided to secure their financing. For mining companies, provisions for activities in consideration make a significant impact on their financial position. Below (Figure 1), data for 13 selected companies are shown, presenting the share of decommissioning provisions in the total of provisions disclosed in financial statements for 2024 (with the exception of Vale). In most cases, their share exceeds 75%. Only in two cases is it remarkably smaller, just surpassing 50%. For BHP, the reason is incidental. A fall of one dam (Samarco mine) triggered the recording of an extra 6505 million USD liability. Without that event, decommissioning-related reserves would make 78,13% of the company's total. PGE – Polish Energy Group is mostly an electricity company with two lignite operations; therefore, a relatively low share of decommissioning provision is a natural consequence of its business structure.

The provisions under consideration make up an important part of balance sheets in general. Below (Figure 2), their share in total liabilities and shareholders' equity is presented (left axis) along with their relation to accounts payable – typically the biggest individual

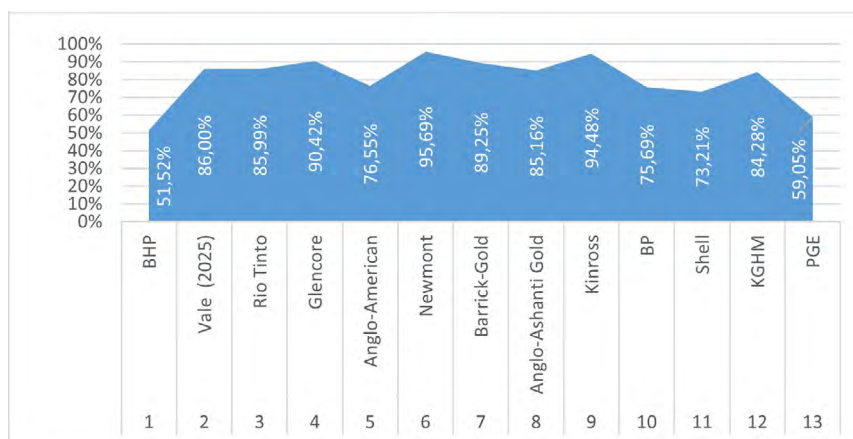


Fig. 1. Share of decommissioning provisions in total provisions of selected companies

Source: own based on data from companies' annual reports (AngloAmerican 2025; Ashanti 2025; Barrick Gold 2025; BHP 2025; BP 2025; Glencore 2025; KGHM 2025; Kinross Gold Corporation 2025; Newmont 2025; PGE 2025; Shell pl 2025; Tinto 2025; Vale 2025)

Rys. 1. Udział rezerw na zobowiązania z tytułu likwidacji kopalń w całości rezerw na zobowiązania wybranych spółek

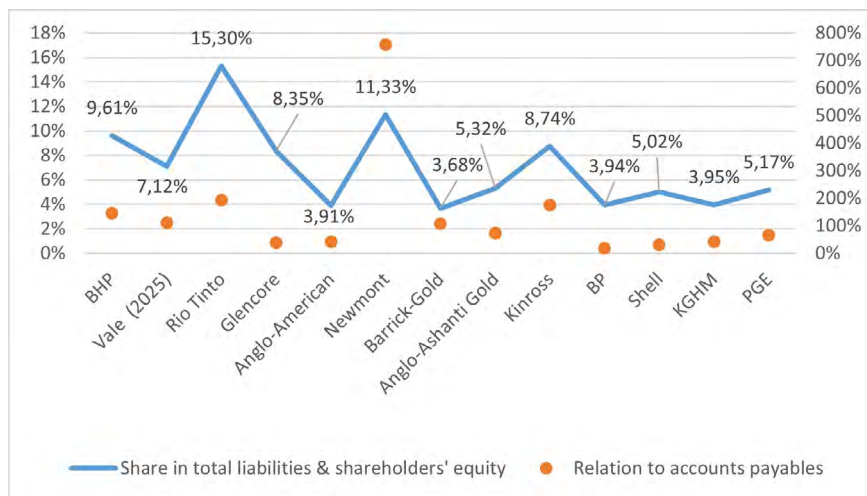


Fig. 2. Decommissioning liabilities as % of total liabilities and shareholders' equity (left axis), and in relation to accounts payable (right axis)

Source: own based on data from companies' annual reports (AngloAmerican 2025; Ashanti, 2025; Barrick Gold 2025; BHP 2025; BP 2025; Glencore 2025; KGHM 2025; Kinross Gold Corporation 2025; Newmont 2025; PGE 2025; Shell pl 2025; Tinto 2025; Vale 2025)

Rys. 2. Rezerwy na zobowiązania z tytułu likwidacji kopalń jako % pasywów (lewa oś) oraz zobowiązań handlowych (prawa oś)

item. The median share in the total liabilities and SE is 5.3%. Three companies with the smallest result: Anglo-American, BP and KGHM noted slightly less than 4%. On the other side, there's Rio Tinto with more than 15% share. To understand the importance of these provisions, it is worth comparing them to the accounts payable (liabilities towards commercial suppliers) – typically the biggest individual item amongst liabilities. In six cases (so nearly half of the sample), the result is in favor of decommissioning provisions, with an extreme case, Newmont, where they are 7.5 times bigger. On the other side, they never fall below 30% (with Shell's 30.4% as the lowest number).

It is interesting to note that a growing part of provisions is related to already closed mines. Data were available only for three companies and are presented below (Figure 3). They indicate that with growing maturity of mining assets, companies have to pay growing attention to processes related to retired mines.

In the context of the above-presented data, it may come as a surprise that when Poland started the transformation to a market-based economy around 1990, leading world mining countries had yet to develop specific regulations and practices related to the area in consideration. Traditionally, non-US enterprises were applying the IAS 37: "Provisions, Contingent Liabilities and Contingent Assets", which became operational in 1999, although earlier certain national regulations set some requirements (IFRS 2020). In general,

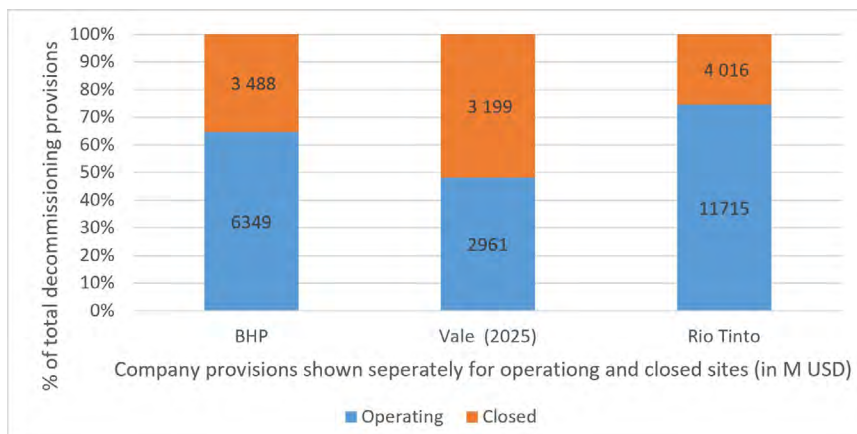


Fig. 3. Decommissioning liabilities distribution between operating and closed sites
Source: own based on data from companies' annual reports (BHP 2025; Tinto 2025; Vale 2025)

Rys. 3. Rezerwy na zobowiązania z tytułu likwidacji kopalń w podziale na dotyczące działających i zamkniętych kopalń

IAS 37 assumes that the obligation to recognize expenditure on decommissioning (and land reclamation) after the end of production activities may result from two premises:

- ◆ applicable law,
- ◆ “constructive obligation”,

or a combination of both. It has to be underlined, though, that the IAS 37 scope is very wide, and decommissioning liabilities were not at the center of its authors' attention.

In the USA, the first accounting regulation related to decommissioning appeared much earlier, with the introduction of FAS 19: “Financial Accounting and Reporting by Oil and Gas Producing Companies” in 1977 (FASB 1977). The Statement introduced the requirement to include estimated closure costs as well as residual salvage value in determining relevant depreciation rates. The problem was that it provided no guidelines concerning the reporting for related commitments. The first noticeable difference between US GAAP and IFRS refers to naming. Americans apply the notion “Asset Retirement Obligations (ARO)” while European counterparts prefer to use the notion “decommissioning”.

1. Developments of accounting regulations in the US and Europe

1.1. US regulations

In the US, the FASB first addressed specifically the problem of decommissioning liabilities by issuing in 2001 Statement no. 143: Accounting for Asset Retirement Obligations

(FASB 2001). The statement applied to retirement obligations for tangible long-lived assets. It required entities to recognize asset retirement obligations at their fair value. In combination with the definition of this notion, it would imply that companies would have to identify an informed willing party that would agree to assume obligations in consideration for market-based compensation. As such, a market typically did not (still does not) exist; it consequently implied a need to estimate an appropriate fair value, in most cases, applying a present value technique. The first adoption was set for the fiscal year 2002/2003. Before such liabilities had been accounted for via changes in depreciation schemes (Alexander and Hiner 2001). It clearly stipulated that asset retirement obligations must have been recognized when an obligating event took place, although with the provision that its fair value could reasonably be estimated. If not, the recognition should be included at the earliest date when such reasonable estimate could be provided. It also clearly stated that to offset the asset retirement liability entry, the entity must have capitalized the asset retirement costs as an increase in the carrying amount of the related long-term asset. So, in fact, half of the initial value of a pit might have been represented by a present value of related retirement obligations, while the other half resulted from proper construction costs.

In practice, a mining enterprise had to estimate the cash flows required to settle a retirement liability. Moreover, it would have to make those estimates consistent with information and assumptions “marketplace participants” would use, disregarding proprietary information and internal cost structures should they differ materially from market conditions. As decommissioning typically is a lengthy and complicated process, to take place in a distant future, it was clear that entities, while estimating the amount and timing of the related cash flows, must incorporate assumptions regarding inflation, technology advances, and other factors. Consequently, a mining company was expected to determine the extent to which the cash flow values or the timing would vary under different future scenarios and the relative probabilities of each (Alexander and Hiner 2001).

Development of the US regulation was pursued via so-called codification efforts, under the FASB Accounting Standards Codification (ASC). Within this framework a dedicated to ARO ASC 410-20 was introduced in July 2009 (Sandip and Avinash 2024). The foundations for current regulations were laid down slightly later, in October 2012, with stipulation of ASU 2012-04. This update significantly revised the original version of ASC 410-20, clarifying concepts like fair value and adding implementation guidance, becoming a key version for current practice. Firstly, it defines when ARO should be disclosed in financial statements. To determine whether an entity should establish whether (EY 2025a):

- ◆ it has a present duty or responsibility to one or more entities that entails settlement by probable future transfer or use of assets;
- ◆ it has little or no discretion to avoid a future transfer or use of assets;
- ◆ an obligating event already has occurred.

What is very important is that p. 25–27 stipulates that the obligation to recognize ARO is unconditional even though uncertainty exists about the timing and/or method of settlement. Thus, a mining company must disclose a liability for the fair value of a conditional asset

retirement obligation if the fair value of the liability can be reasonably estimated. Uncertainty shall be applied to the measurement of the fair value of the liability through assignment of probabilities to cash flows. P. 25–28 defines two alternative options when information available is considered sufficient to calculate the value of ARO:

The settlement date and method of settlement for the obligation have been specified by others, for example, the law, regulation, or contract – thus the settlement date and method of settlement are known, and the only uncertainty is whether the obligation will be enforced (that is, whether performance will be required). In certain cases, determining the settlement date for the obligation that has been specified by others is a matter of judgment that depends on the relevant facts and circumstances (like a contract that can be renewed). However, uncertainty about whether performance will be required does not defer the recognition of an ARO because a legal obligation to stand ready to perform the retirement activities still exists.

The information is available to reasonably estimate both of the following: the settlement date or the range of potential settlement dates and the method of settlement or potential methods of settlement.

The latter case leaves more space for individual interpretations. Therefore, it was stipulated that the term potential methods of settlement refers to those currently available. Consequently, uncertainty about future methods yet to be developed would not prevent the entity from estimating the fair value of the ARO.

In essence, ASC 410-20 leaves very little room to avoid ARO's disclosures in financial statements. In the majority of cases, the obligations under discussion would result directly from the law (like in Poland), and in such a case the obligation is unconditional. In practice, mining companies may avoid reporting some “soft” obligations resulting from their own ESG-related declaration if they assume they will be able to substantially alter or void them. The only clear exception refers to assets with indeterminate useful life, which is not the case of mineral deposits/mines. Indeterminate must be interpreted here as related to assets which, under current conditions, can be used indefinitely, like for example a petrol station. Till no decision has been made to discontinue its operations, it must be considered on an ongoing basis, so retirement cannot be deemed a reasonable scenario. In contrast to the IAS provisions, the US GAAP requires consideration of only legal obligations, not including so-called “constructive obligations”.

From the mining industry perspective, it is important to note that p. 55–59 requires components to be accounted for separately if their retirement time differs from that of other parts. In many cases, certain sections of the open pit could be reclaimed well before the mine closure. In practice, enterprises prefer to include the related expenses in operational costs, mainly due to tax reasons.

It has to be underlined that the US regulations are considered far from being sufficient by numerous stakeholders. The Hogan-Lovel law firm, in cooperation with BNP Paribas, estimated that the total US decommissioning liabilities amounted in 2023 to 8 trillion USD, while only 0.5 trillion had been pre-funded. The share of conventional mining (with coal

and hydrocarbons) was only 30%. The remaining balance was distributed between nuclear power plants (ca. 25%), renewables (close to 20%), industrials, shipping and landfill (together remaining 25%) (Emily et al. 2025).

1.2. EU regulations

The European Union addressed the problem of recognition and valuation of environmental liabilities for the first time specifically through the Commission recommendation of May 30, 2001, concerning the recognition, measurement and the publication of environmental issues in the annual accounts and annual corporate reports (EU Commission 2001). Paragraph 4 envisaged that an environmental responsibility was recognized when a reliable estimate of the costs of the obligation can be performed. If, on the date of the balance sheet, there is an obligation whose nature has been defined clearly but does not have certainty in the amount or the date, the entity would have recognized a provision, provided that a reliable estimate of the amount of the obligation could be made. The recommendation advocated the registration of a provision for the restoration of contaminated sites and the costs of decommissioning, but allows another option (Domiguez and Curos 2018).

IASB ran a five-year-long project (2005–2010) aimed at amending IAS 37. It was discontinued without conclusion, pointing to another priority as a reason. The final draft recognized three measurement methods to be applied to liabilities:

- ◆ the present value of the resources required to fulfill the obligation;
- ◆ the amount that the entity would have to pay to cancel the obligation;
- ◆ the amount that the entity would have to pay to transfer the obligation to a third party.

The implementation of International Financial Reporting Standard 6 (IFRS 2005) Exploration and Evaluation of Mineral Resources, which has been in force since January 1, 2006, did not bring any new requirements in the area of provisions for decommissioning liabilities, as it refers to IAS 37 (p. 11), as a document regulating the manner in which provisions for land reclamation are recognized in the financial statements.

In general, IAS 37 assumes that the obligation to disclose expenditures on land reclamation after the end of operation in financial statements may result from two premises (IFRS 2020):

- ◆ applicable law,
- ◆ “constructive obligation”.

Similarly, the sources of the reclamation obligation were treated by the EU Commission in the above-mentioned Recommendation of May 30, 2001, specifying that the financial statements of the companies covered by it were to disclose the environmental policy applied by the entity and the established programs in relation to specific issues, including land reclamation. In Article 3, the Recommendation defined the conditions that the reclamation obligation must meet in order to be included in the financial statements, de facto copying the relevant provisions of the IAS. Other key issues presented below, such as the issue of

reimbursement of part of the expenditures, the incorporation of the scenario analysis, or the use of discounting, are also regulated in the same way as in the IAS.

The concept of “constructive (implied) obligation” assumes that the company will carry out reclamation despite the absence of such a legal obligation, because such action will result from its policy (corporate rules). The prerequisites for such an “implied obligation” are:

- ◆ the requirement to make public the principles on which it derives,
- ◆ the practice of fulfilling such an obligation when there are prerequisites for its performance.

The above principles should be used in conjunction, as it may happen that the scope of reclamation works required by law turns out to be smaller than that resulting from the company’s practice. At this point, it should be noted that the application of the concept of “constructive obligation” in practice faces many obstacles. Statutory auditors often have a serious problem deciding at what point an announced policy or practice becomes a liability of the company. Especially in countries whose legal system is based on established law, with a very limited and auxiliary role of common law, it will probably be difficult to enforce such an obligation in court. This opens the door to various types of tricks that can be aimed at, for example, misrepresenting the company’s results. On the other hand, however, environmental issues are so popular, and the movements of the groups dealing with them are such a powerful force of pressure, especially in some Western European countries (Germany, the Netherlands, the Nordic countries), that it is difficult to assume that mining companies can act with impunity against their expectations of these groups, especially if they are supported by previous conduct or publicly made promises.

1.3. Polish domestic regulations

In general, Polish regulations have relied on IAS in respect of disclosures of decommissioning liabilities. Since the Accounting Act has not treated the analyzed issue in any particular way, companies must have referred to IAS, specifically to IAS 37 “Provisions, Contingent Liabilities and Contingent Assets”, as there is a reference to IFRS or to the general principles of accounting and practice. It results from the Accounting Act: Article 2(3) with regard to companies obliged to apply IFRS (mainly public) and Article 11(3) with regard to others (Accounting Act 1999). IFRS have not yet been issued to replace all previously applicable IAS/IFRS. The only exception is IFRIC Interpretation 1, but it concerns only the specific issue of recognizing changes in the reporting of changes in respect of the provisions in question. On the other hand, in May 2017, the Ministry of Finance adopted National Accounting Standard No. 11 Fixed Assets (Komitet Standardów Rachunkowości 2017), which differs from the principles applied in IFRS (specifically IAS 37) in that it does not allow the provision for decommissioning to be related to the initial value of the fixed asset, but requires the use of accruals for this purpose in accordance with the principles set out in the National Accounting Standard No. 6 “Provisions, accruals of costs, contingent liabilities”. However, this is an irrelevant circumstance from the

point of view of this study, as the difference between the Standard and IFRS discussed does not concern the provision itself but the corresponding account registration.

1.4. Consequences of accounting regulations for managing value of mining companies

Analyzing ca. 50 years of development of regulations and their application practices, one shall conclude that the following three issues related to finance/accounting pose a fundamental challenge and have not been satisfactorily addressed so far:

- ◆ including a risk of error in estimation of future expenditures needed to set the obligations considered;
- ◆ identification of a proper discount rate;
- ◆ recognition of benefits resulting from completion of decommissioning works.

The above list does not include estimation of future expenditures *per se*, as it shall be the result of the appropriate planning, which is engineering practice. This issue will be covered extensively by another article in the series to come soon.

It is also worth mentioning that some obligations may be perpetual, especially when water pumping is necessary after closure (the author owes one of the reviewers for pointing out this problem). The cost of water processing can continue theoretically till infinity. In reports under analysis, only Rio Tinto directly addressed this issue (Rio Tinto 2024). It leaves it for further consideration related to the alternative commercial use for the processed water, which could support ultimate transfer of these costs to a third party.

The first challenge results from a typical long time distance between the first disclosure in a financial report and the commencement of the decommissioning process. Mineral deposits are developed with a perspective of a minimum of 10 years of exploitation, and typical durations range from 20 to 50 years. Sometimes the production period spans over centuries – Turów lignite mine, to provide a real-life example, has already passed 120 years of continuous production. Should the above-presented regulations have existed in 1904, then the Turów operating company would have to estimate the value of decommissioning works to be carried out between years 2040–2070. In such a distant perspective, it is even difficult to stipulate what will be the final aim of decommissioning and land reclamation, not to mention accurate calculation of expenses. A mine constructed in a farming area, distant from any big city, may end production near a medium-sized town with several fast railway connections to a neighboring 2 million metropolis. Certainly, there is no other option but to identify the most likely scenario at the time of estimating the liability and adjusting it as the context changes. With the consciousness that alterations might be substantial. Finance, both as a science and practice, has developed various tools to recognize uncertainty factors while analyzing investments and the value of assets. On the contrary, liabilities typically have been considered as known. Therefore, sufficient tools to calculate the impact of risk on the value need to be developed.

A challenge regarding the application of an appropriate discount rate results to some extent from the previously outlined factor. A conventional use of this concept refers rather to cash inflows than outflows. Evaluating investment projects, analysts take into account both categories, but eventually they take into consideration net value, which is dominantly positive. Consequently, they apply a higher discount rate (calculated from various models) to sets of cash flows with higher estimated risk levels, resulting in relatively lower present value. Such logic is widely recognized and reflects reality. However, mechanical transfer of such practice may bring questionable results. The mechanism of a discount rate has an effect contrary to elementary logic, because the higher the rate is, the lower the present value of the discounted cash flows is obtained, and, in the case of liabilities, the lower their value will be. In the extreme case of distant liabilities and high uncertainty, they will be valued at zero even if such obligations are substantial. Reporting entities are skewed towards driving the value of equity up and thus are motivated to take advantage of a discount rate logic to drive down the present value of their distant liabilities. Therefore, a new approach needs to be developed and tested.

2. Calculation of present values of decommissioning liabilities – a discount rate

2.1. Theoretical background

To analyze the premises for applying discount rates to calculate the present value of decommissioning liabilities, it is necessary to review the fundamentals of the discounting concept. It is based on the assumption that for losing direct control of money for a certain period, an owner (like an investor, creditor, etc.) must be compensated by receiving an increased amount of money in the future (at an expiration date). Discounting only reverses known and unknown variables, as it takes a future value as a set one and allows it to calculate its present value. It is widely recognized that such compensation must have covered at least three negative consequences: lost liquidity, purchasing power variation, and risk assumed. Liability implies mirroring the first factor: liquidity lost becomes liquidity gain. But the latter two cannot be interpreted in such a simple manner. In the case of purchasing power and financial liabilities, a final result represents a perfect match – at the expiration date, whatever a creditor/investor loses, a debtor gains. In anticipation, both parties carry risk of deviation from expected results. From the application point of view, there is typically a positive solution to recognize the costs and benefits of the first two factors in consideration: liquidity and purchasing power. It is achieved by referring to the nominal rate of risk-free instruments, like state bonds. One can assume that, in the case of a financial liability buying fixed-rate, risk-free instruments (or so-called zero-coupon bonds) to expire at the due date of such liability perfectly matches it. It is a simple mechanism. An entity obliged to pay,

say, 5 million USD two years hence buys two-year US zero-coupon bonds for, say, 4.3 million USD, registers them on a ring-fenced account, and considers this liability as fully covered with all risks hedged. Decommissioning liabilities are to be settled in real terms via completion of a scope of work. Financial outlays needed to fulfill this duty are not defined but estimated with a risk of deviation. The nature of this risk is very different from the one assumed by an investor. First of all, it refers to cash outflows, not net inflows. Moreover, it is not related to the market of mine's products. Nor to the majority of other factors typically considered in valuations of mineral assets. In most cases, risk results from two main areas: uncertainty about scope of work and costs of construction work. Here we deal with something close in nature to insurable rather than investment risk. In the former case, getting certainty implies paying insurance premiums, not discounting. Applying the latter approach leads to counterintuitive results. A higher risk implies a higher discount rate, thus diminishing the liability's present value. So, a mining enterprise's equity value becomes positively correlated with the risk level associated with decommissioning obligations.

2.2. Intrinsic flaws of discount rate when applied to calculate present values of decommissioning liabilities

The intrinsic flaw of applying the discounting technique to calculate the present value of decommissioning liabilities is best visualized using an extreme example. Let us assume that the construction of a mine has just commenced; it is expected to last 2 years, to be followed by a 28-year production period. Let us assume too that the estimated value of decommissioning liabilities at the production end was estimated at 2 billion PLN (present, constant prices), but the uncertainty level was considered to be very high – speculative. Consequently, a near speculative discount rate should have been applied, say, 25%, and the present value of the liability in consideration would have been calculated as ca. 2.48 million PLN. We should believe that putting aside 2.48 million PLN (for example on an escrow account) guarantees fulfilment of the decommissioning liabilities estimated at 2 billion PLN 30 years hence. We could assume that the escrow account will carry a risk-free interest rate (typically interest rates are lower, but this issue is not important for the subsequent analysis). In most cases, a real (net of inflation) interest rate moves within the range of 1–2.5%. So, assuming 2% is acceptable. Under such premises, the escrow account will carry 4.48 million PLN at the end of the period, presumably sufficient to cover 2 billion PLN liability. The gap results from the high-risk level. Effectively, the outcome of calculations performed implies that under the most probable scenario, the company believes it will spend 0.22% of the original estimate to cover in full its decommissioning liability. Later, this gap narrows down (Table 1, Figure 4). But even 5 years to closure, only ca. 36% of the original estimate will be covered. Still, if an additional assumption is applied to recognize diminishing risk level over time, the results clearly indicate the existence of a significant gap, even if of a smaller magnitude (Table 2, Figure 5).

Table 1. Decommissioning liabilities financing gap – theoretical calculation for an extreme case – applying a constant discount rate

Tabela 1. Luka finansowania zobowiązań z tytułu rekultywacji – obliczenia teoretyczne dla skrajnego przypadku – z wykorzystaniem stałej stopy dyskonta

Years to mine closure	Yers	30	25	20	15	10	5
Expected decommissionin outlays	million PLN	2,000	2,000	2,000	2,000	2,000	2,000
Present value of decommissionin liabilities	million PLN	2.48	7.56	23.06	70.37	214.75	655.36
Future value of the corresponding escrow account at risk free rate	million PLN	4.48	12.40	34.26	94.71	261.78	723.57
Liabilities financing gap	million PLN	1,995.52	1,987.60	1,965.74	1,905.29	1,738.22	1,276.43
Discount rate	%	25					
Risk-free rate	%	2					

Source: own calculations.

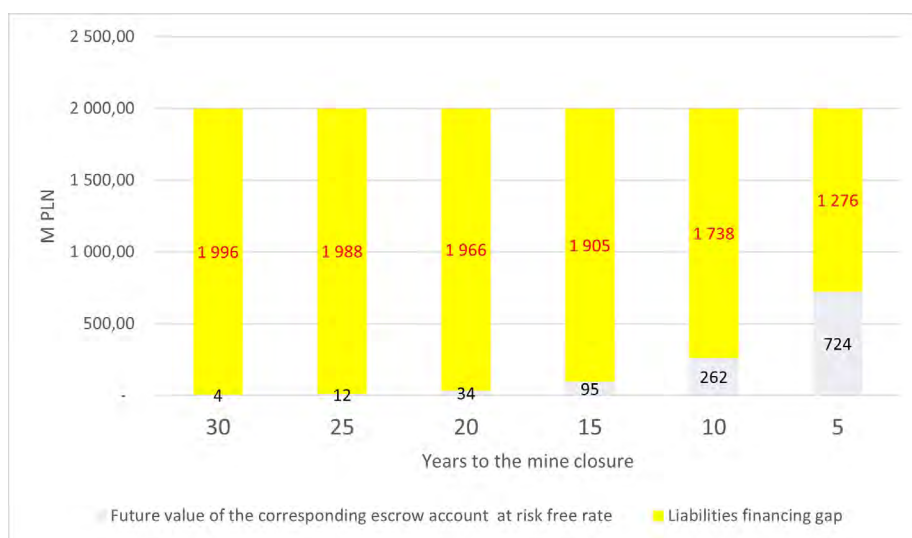


Fig. 4. Decommissioning liabilities financing gap – theoretical calculation for an extreme case – applying a constant discount rate

Source: own calculations

Rys. 4. Luka finansowania zobowiązań z tytułu rekultywacji – obliczenia teoretyczne dla skrajnego przypadku – z wykorzystaniem stałej stopy dyskonta

Table 2. Decommissioning liabilities financing gap – theoretical calculation for an extreme case – applying descending discount rate

Tabela 2. Luka finansowania zobowiązań z tytułu rekultywacji – obliczenia teoretyczne dla skrajnego przypadku – z wykorzystaniem spadającej stopy dyskonta

Years to mine closure	Yers	30	25	20	15	10	5
Expected decommissionin outlays	million PLN	2,000	2,000	2,000	2,000	2,000	2,000
Present value of decommissionin liabilities	million PLN	2.48	13.87	61.67	215.85	589.18	1,241.84
Future value of the corresponding escrow account at risk free rate	million PLN	4.48	22.75	91.64	290.51	718.20	1,371.09
Liabilities financing gap	million PLN	1,995.52	1,977.25	1,908.36	1,709.49	1,281.80	628.91
Discount rate	%	25	22	19	16	13	10
Risk-free rate	%	2					

Source: own calculations.



Fig. 5. Decommissioning liabilities financing gap – theoretical calculation for an extreme case – applying descending discount rate

Source: own calculations

Rys. 5. Luka finansowania zobowiązań z tytułu rekultywacji – obliczenia teoretyczne dla skrajnego przypadku – z wykorzystaniem spadającej stopy dyskonta

The above-presented case represents an extreme but thus portrays very well the issue under consideration. Applying a discounting technique to value decommissioning liabilities delivers misleading results, and such practice should be rejected.

2.3. Environmental economists – critique of applying traditional discounting to environment related flows

Environmental economists traditionally criticized the application of traditional discounting to environmental-related flows. Originally, they underlined a rising scarcity of nature. For example, Fisher and Krutilla (1975) argued that the rapid depletion of natural capital stocks should lead to the application of a lower effective discount rate on environmental benefits versus market financial values. A lower discount rate should be applied to environmental benefits when the “relative scarcities between different goods are changing over time, yet, future consumption is valued at constant relative prices, or future prices for environmental goods are unavailable” (Baumgartner et al. 2015). Other authors apply lower discount rates on environmental benefits in cases involving climate change (Sterner and Persson 2008), cost-benefit analysis for environmental projects (Kula and Evans 2011) or ecosystem services (Baumgartner et al. 2015). Such practice received the name of “dual-discounting”. Recently, one can observe a growing wave of arguments against the application of any discount rate at all. It is based on a claim of equity and fairness between generations. Thomas Schelling has argued that discounting is not the appropriate concept to apply for climate change or other long-run environmental problems. It should be replaced by the redistribution approach, as the main objective of actions in these areas is not a gain but sustainability (Schelling 1995). Discounting essentially favors present (or near) actions at the expense of ones to occur in a distant future, while the intergenerational justice concept can serve as a base for a claim that they should be valued equally. One should note an immensely reductive influence of discounting in the case of flows to occur in the distant future. Davidson indicates that discounting at a typical constant rate of 6 percent means that spending less than nine dollars today should be sufficient to offset a million-dollar liability two hundred years hence (Davidson 2014). The discussion concentrates primarily on investments/assets, not liabilities. Since pro-environmental concepts constantly gain importance, one may expect that pressure to apply relatively low or even zero discount rates will grow, especially in relation to liabilities.

The hope that the application of multi-attribute decision-making models can produce the desired results is based on the fact that project scheduling and budgeting are based on models that use this concept to some varying degrees. However, the main problem will probably be to collect a sufficient database to reliably assess the probability of individual scenarios and values for extreme scenarios. The best suited for application of such models are offshore hydrocarbon platforms. They are situated in a relatively similar environment, quite standardized from a technical point of view, and numerous. There are around

8000 platforms globally concentrated in a few regions (the North Sea, the Gulf of Mexico, offshore California). Essentially, they are technical constructions with very limited direct intervention in the environment (no excavation, movement of soil, etc.), often designed to be relatively easily relocated and/or decomposed. Therefore, a few service companies developed software-based systems for evaluation of various options like PLATFORM or DAPSI(W)R(M) (Li and Hu 2022). The key deficiency of MADM models relates to an extensive inclusion of quite subjective criteria. Although on a high level they look very formal and supported by mathematical calculations a deeper analysis typically reveals that many important values are actually assumed based on experts' knowledge or "educated guess". And finally, such models do not provide information about the optimal discount rate but apply one pre-selected (often a risk-free rate).

The use of risk assessment models developed by the insurance industry to determine premiums (policy prices) poses several methodological challenges. Such policies are offered by various providers, namely as surety, insurance, or performance bonds. Since they have to include a provision under which the responsibility commences in the distant future and with the scope very uncertain, insurers insist on placing an upper limit on their exposures. Therefore, the premium does not refer to the whole liability but to its part (of course unless the upper bound is high enough to provide full coverage in the worst-case scenario). To make the application of insurance premium even more complicated, many contracts require a mining company to create a corresponding sinking fund, limiting the insurer's exposure. Moreover, bonds are issued for a specific period, not necessarily corresponding to a planned closing time frame. They can be renewed for subsequent periods, but then many factors not related to decommissioning are analyzed, like a company's overall financial standing. Complexity and heterogeneity of surety bonds provisions make it nearly impossible to get standardized premium values. The only paper the author found, which was based on a significant amount of data, comes from the 1990s. The range presented there was 0.37–1.5% annually of a face value (Gerard 2000). With all the presented herewith challenges and deficiencies, the insurance approach has one unquestionable advantage – it reflects reality. If an investment discounting converts future uncertainty into current precise value, insurance does the same for non-financial liabilities.

As a result of the above-mentioned analysis, a mechanical copying of discounting practices as applied for the valuation of investment projects should not be practiced in establishing the current value of decommissioning liabilities. It has to be replaced by a new concept, using properties of insurance policies (property bonds), scenario analyses, and, in a very limited way, discounting.

2.4. Determination of a discount rate when recognizing the value of provision for mine decommissioning liabilities according European and American rules

Considering regulations and scientific proposals, the discount rate applied to calculate the present value of decommissioning liabilities can be, in practice, established using the approaches listed below (Hodgkinson and Oldham 2012):

- ◆ a zero rate (no discounting at all),
- ◆ a risk-free rate,
- ◆ risk-free rate adjusted for non-performance risk,
- ◆ company risk- adjusted rate,
- ◆ socially viable rate,
- ◆ weighted average cost of capital (company or specific for a mining project).

The major challenge refers to the risk of inclusion. A significant evolution has occurred over the last 20 years regarding this issue. It started when deficiencies of mirroring practices from investment evaluation had become indisputable. The discussion concentrated along the following paths:

- ◆ how to recognize an estimation risk,
- ◆ whether a non-performance risk is to be recognized in setting the discount rate or in another way.

In essence, it can be summarized as a dilemma whether to apply a risk-free rate and recognize risk factors in some other ways or to keep the practice of including risk via adjusting discount rates.

The US ASC 410-20 follows ASC 820 (FASB 2022) guidance, allowing for two present value techniques:

- ◆ the discount rate adjustment technique,
- ◆ the expected cash flow (expected present value) technique.

It strongly recommends the latter one, as the only appropriate technique for measuring an ARO liability is to use observable interest rates for liabilities that have cash flows like an ARO generally does not have. Application of a discount rate adjustment technique requires that the rate must be inferred from the observable rate of interest from some similar liability to the one being measured. Thus, the appropriate discount rate cannot be established. The expected cash flow technique uses scenario analysis to include a range of possible outcomes. Probability-weighted expected cash flows are all to be discounted using a risk-free interest rate, adjusted for the obligor's credit risk. The risk-free interest rate is defined as a rate of return on a zero-coupon U.S. Treasury instrument. It should be adjusted, though, for the effect of the entity's credit standing. And here clear guidelines are missing. A natural would be to apply the borrowing cost of debt of a similar maturity. The adjustment should consider the effects of all terms of such borrowing, including cost of collateral and guarantees. FASB added one important point here. It expects that the so-calculated ARO value will be adjusted by a market-risk premium – the premium a market participant would request for assuming an obligation for a fixed price at the reporting date. It is a logical expectation.

However, only very few cases exist of an ARO being transferred to a third party based on a regular contract (closure obligations are moved in between various entities of a holding group, but such transactions are not considered market-based). Interestingly, FASB is aware of the difficulty in determining the appropriate risk premium but deems it not a sufficient basis for excluding such adjustment. Therefore, a fair value measurement that uses present value, such as an ARO, should include an adjustment for risk regardless of the difficulty in estimating that market risk premium. It may be incorporated either into the expected cash flow or the discount rate.

For a long time, the IAS 37 (IFRS 2020) required that the discount rate should be a pre-tax one that reflected current market assessments of the time value of money and the risks specific to the liability, except risks for which future cash flow estimates have been adjusted. From 2014 to 2017, IASB conducted a dedicated research project on discount rates in IFRS Standards with the objective of investigating inconsistencies between requirements relating to discount rates in various IFRS Standards, eventually leading to identification of amendments needed to address them. Findings were summarized in the summary of March 2019 (Brown 2019). Four years later, the exposure document was issued proposing significant changes to the IAS 37 regulations, specifically addressing the issue of applying discount rates in the case of provisions. It was noted that the effect of discounting was most likely to be material for large long-term provisions like provisions for asset decommissioning and environmental rehabilitation costs (EY 2025a). It mostly refers to entities operating in the oil and gas, mining, utility (including power generation), and telecommunications sectors. The following key properties of discounting cash flows settling liabilities were recognized:

- ◆ reflecting non-performance risk in a discount rate increases the rate resulting in smaller liabilities and lower gearing,
- ◆ thus allowing for reporting larger profits in the earlier years and smaller profits in the later ones,
- ◆ and consequently, reporting higher gross profit margins and correspondingly larger finance costs.

In addition, it was observed that “the discount rate should not reflect the entity’s own credit rating, because otherwise an entity with a lower credit rating would recognize a smaller liability”.

In reference to the issue of incorporating risk factors, it was underlined that it was understood as the variability in the cash flows required to settle the liability, which would generally be reflected by either increasing the estimates of the cash flows or by decreasing the discount rate. The risk that the entity would fail to settle the liability could not be reflected by increasing the discount rate (as is regularly done for asset valuation) (EY, 2025b).

Also, consequences regarding underlying information provided to investors were indicated. If provisions are discounted at a rate that excludes non-performance risk, the provision is equal to the amount needed to be invested in risk-free assets to fund the settlement of the obligation when due. Simultaneously, if provisions are discounted at a rate that includes non-performance risk, it makes the provision more comparable with other

liabilities measured at a current value but is less onerous than an otherwise-identical liability that does require the entity to pay a non-performance risk premium. But it gives “counter-intuitive” outcomes. If the discount rate for a liability reflects non-performance risk, an increase in that risk results in the reduction of the liability and causes a gain, increasing the profit. People often describe that outcome as counter-intuitive and argue that recognizing a gain from a deterioration in an entity’s financial position is misleading. An argument was put forward that such an effect typically carries less weight for provisions than for other liabilities. Effects of discounting decommissioning and environmental rehabilitation provisions typically are not recognized as gains impacting profits, as they are deducted from the cost of the related property, plant or equipment (EY 2025b).

2.5. Corporate practices

In practice, it turns out that even more precise American regulations leave companies with considerable freedom of interpretation. Below is a summary of the types of discount rates adopted by the world’s leading mining companies in the 2011 financial reports (Table 3) (ed. Hodgkinson and Oldham 2012). It shows quite a mixed picture, with the risk-free approach gaining minimal advantage over others.

Table 3. Methods for determining the discount rate for calculating provisions for mine decommissioning used by 19 leading mining companies in the world in 2011

Tabela 3. Metody ustalania stopy dyskonta stosowanej do obliczania wartości rezerw na zobowiązania z tytułu likwidacji kopalń, stosowane przez 19 wiodących spółek górniczych w 2011 r.

Method of determining the discount rate	No of reporting companies
Long-term, risk-free cost of borrowing	2
Risk-free interest rate	3
Current inflation adjusted risk-free interest rate	1
Risk-free interest rate specific for the country where operations are located.	2
Current US dollar real risk-free pre-tax discount rate	2
Total for methods applying a risk-free rate	10
Pre-tax rate	6
Pre-tax rate that reflects the estimated maturity of each specific liability	1
Discount rate that reflects current assessments and the risks specific to the liability	2
Total for other methods	9

Source: own based on (ed. Hodgkinson and Oldham 2012).

Unfortunately, later similar reports issued by KPMG and PWC did not contain similar lists (ed. Hodgkinson and Ricica 2016; Mokone et al. 2017). However, they showed that the approach based on the use of a risk-free rate defined in one way or another had been gaining a significant advantage over others. It had advanced significantly. The author compiled data for the 13 companies to find that only one has not adopted this approach yet (Table 4).

Table 4. Methods for determining the discount rate for calculating provisions for mine decommissioning used by 13 leading mining companies in the world in 2024

Tabela 4. Metody ustalania stopy dyskonta stosowanej do obliczania wartości rezerw na zobowiązania z tytułu likwidacji kopalń, stosowane przez 13 wybranych spółek górniczych w 2024 r.

No.	Company	Risk-free (Y/N)	Comments
1	BHP	not disclosed	Individual site provisions are discounted to their present value using currency specific discount rates aligned to the estimated timing of cash outflows.
2	Vale	Y	Not disclosed but values given suggest a risk-free rate: e.g., Canada 1.81%.
3	Rio Tinto	Y	Real risk-free 2.5% for all countries.
4	Glencore	Y	The average annual real-terms return on a relevant government security with a tenor of 20 years.
5	Anglo-American	Y	Pre-tax (risk free) discount rate.
6	Newmont	N	Company's credit-adjusted risk-free rates and a market risk premium appropriate for the Company's operations.
7	Barrick-Gold	Y	Provisions are discounted to their present value using a current US dollar real risk-free pre-tax discount rate.
8	Anglo-Ashanti Gold	Y	Discount rates applied to calculate the present value of estimated costs by comparing the rates applied by management to the yields on government bonds with maturities approximating the timing of cash flows for each territory and currency.
9	Kinross	Y	3.8–8.4% with inflation rate 1.9–4.2%.
10	BP	Y	BP increased the discount rate used in calculating its decommissioning provisions from 4.0% as at December 31, 2023, to 4.5% as at December 31, 2024. The increase was primarily driven by increased US treasury bond rates.
11	Shell	Y	The discount rate applied at December 31, 2024, was 4.5% (2023: 4.5%).
12	KGHM	Y	Discount rates applied are either the yields on government bonds with maturities approximating the timing of cash flows 5.87% (yield on 10 years Polish bonds) or modified for longes periods according to the Management Board judgments.
13	PGE	Y	5.8% – nominal rate.

Source: own based on data from companies' annual reports (AngloAmerican 2025; Ashanti 2025; Barrick Gold 2025; BHP 2025; BP 2025; Glencore 2025; KGHM 2025; Kinross Gold Corporation 2025; Newmont 2025; PGE 2025; Shell pl 2025; Tinto 2025; Vale 2025).

Typically, companies use the return rate on long-term government bonds as a proxy for a risk-free rate. Such rates are easy to obtain if a nominal value is sought. But then there is a problem of forecasting inflation. Most companies, like BP, estimate that the average rate of forecast inflation applicable to the substantial majority of their decommissioning cost estimates and try to relate it to estimated long-term general inflation rates. They recognize that the extent to which average future decommissioning cost inflation will differ from the general inflation rate depends on many factors which are uncertain. BP notes that industry demand and supply of rigs and other relevant services at the time of future decommissioning are the key determinants, which in turn are to be influenced by future oil and gas demand, and by structural changes in the industry supply chain driven by the energy transition (BP 2025).

The author, while modeling decommissioning liabilities, prefers to use real rates of return (inflation-free) and constant prices to avoid making assumptions on various inflation rates. Such an approach should produce the same outcome, provided a general inflation rate and the one applied to decommissioning costs are the same. Companies may have specific knowledge allowing them to determine these rates separately, but there's always risk of underestimating the liability value.

2.6. Summary – discount rate issue

In conclusion, it shall be noted that the author has strongly supported the application of a risk-free rate to discount cash flows to settle decommissioning liabilities since 2011. The intrinsic flaws of the discounting technique when applied have been convincing for most practitioners. Recent discussion on changes to IFSR regulations only confirmed this fact. The argument about the lack of direct impact of decommissioning provisions on current income statements of mining companies must be rejected. There is no reason to accept flawed estimates only because of the specific accounting rules; such erroneous practice does not impact current profits. It has to be admitted that applying a risk-free rate removes the issue of uncertainty from discounting practice and calls for the development of a new specific methodology to address it. It is a challenging task, as commonly used in such circumstances, methodologies of calculating insurance risk premiums cannot be easily applied due to a lack of sufficient historical data. However, these obstacles must not justify the misuse of risk-adjusted discount rates (Uberman 2010).

3. Calculation of present values of decommissioning liabilities – inclusion of benefits from disposal of remaining assets

Any decommissioning process refers to a mining company asset, which could be land, infrastructure, equipment, and so on. They will be either sold or utilized on another site.

Their disposal is part of closing activities, and sometimes their value might be substantial, even offsetting decommissioning costs in full. Yet, both the US and European accounting regulations do not allow companies to recognize possible gains from disposal of such assets. The US ASC 410-20 states that in determining the amount that a third party would charge to assume the obligation, the FASB concluded that all offsetting cash flows, including salvage values, should be excluded from the computation of AROs. (EY 2025a). Also, the European IAS 37 has always been clear about it. On p. 51, it states that *Gains from the expected disposal of assets shall not be taken into account in measuring a provision*. Later, on p. 52, it stipulates that such gains are not taken into account even *if the expected disposal is closely linked to the event giving rise to the provision. Instead, an entity recognizes gains on expected disposals of assets at the time specified by the Standard dealing with the assets concerned (IFRS 2020)*.

The underlying intentions of both regulators originate from a generally negative attitude to any kind of netting practice, which may lead to substantial miscommunication at least. It is logical that the rehabilitation costs of a property must be disclosed separately from expected benefits of its eventual disposal. These are two separate economic issues. Standards forbid more “natural” netting, like in the case of accounts receivable and payable related to the same entity. There is an argument of prudence; such a sale, especially if to be executed in a distant future, is not only uncertain but also hard for reliable value estimation.

However, one issue remains open. IAS 37 also provides the measurement guidance stating that *the best estimate of the expenditure required to settle the present obligation is the amount that an entity would rationally pay (...) or to transfer it to a third party at that time* (IAS 37 p. 37). Typically, such transfer of liabilities also includes taking over related assets. Sometimes their utilization can more than offset decommissioning costs. The well-known case refers to the telecommunication companies who get compensated by contractors for reclamation of old cables as proceeds from copper sale surpass costs of works. In such cases, the transfer of obligation to a third party not only costs nothing but even produces revenues. In the mining industry, similarly precious elements are embodied in infrastructure: electricity cables, metal construction, etc. Often, they are fully depreciated at closure time. Thus, their disposal does not cause a loss in fixed assets’ value.

The above-indicated approach, although justified from the accounting point of view, should not limit management of mining companies in seeking opportunities to increase and realize the value of retired assets, even if they are no longer related to mining. Companies are unfortunately quite often locked in a pure mineral resources perspective. It is a natural trend to concentrate on key business areas, avoiding stretching resources and loss of strategic focus. A lifetime of a mining project sets the natural beginning and end for management’s interest. Such an approach, from both economic and social and environmental perspectives, must be challenged. It is based on a paradigm that extractive activities destroy environmental and social wealth, providing valuable raw materials in exchange. Thus, they have to be assessed by comparing losses (costs) incurred by the former to the benefits of the latter. It is nearly unthinkable to recognize that transformation of land caused by mining may result

in substantial environmental benefits. But there are such cases. In Poland, near the German and Czech borders, there's a lignite mine "Turów", scheduled to be closed by ca. 2040. The decommissioning plan provides for the creation of an artificial lake on site with a capacity of 2–3 billion m³, which essentially will become the biggest freshwater reservoir in the country, with ownership passed to the state. The biggest artificial lake is Solina with a capacity of 472 million m³, superseded only by Śniardwy (660 million m³), if natural ones are taken into account. Certainly, it is hard to estimate the market value of such assets. Using the cost approach, one can identify that the last big investment of this kind was Świnna Poręba with a capacity of 160 million m³, constructed over a period of more than 30 years till 2017, with an estimated total cost of 2.2 billion PLN. Turów will be at least twelve times bigger, so using the Świnna Poręba benchmark, the construction of a comparable reservoir would cost at least 25 billion PLN. KWB Turów has not had private owners for the last 70 years (it had been nationalized after the Second World War and after 1989 has always been a part of various essentially state-controlled entities). When it was run by private entrepreneurs, nobody thought in such a long perspective. However, at present, any businessman facing an obligation to create a valuable part of environmental infrastructure would not be willing to offer such a generous gift. The Turów example is an extreme and spectacular one, but there are numerous other cases of much smaller magnitude where post-mining assets are utilized in a commercial way, for example as waste deposits, water pumped-storage power plants, or paid recreational facilities (Naworyta and Sikora 2025; Hale 2025). Unfortunately, mining enterprises consider such projects only when extraction approaches an end. It is too late to take advantage of them to limit decommissioning liabilities. Should it be considered at the design stage, the situation would have been different. It is possible and both lawful and ethical that a mining enterprise enters an agreement with a future user stipulating terms of post-closure transfer of property for a pre-agreed compensation. In such a case, an entrepreneur may seek to recognize the proceedings as reimbursement of decommissioning costs and apply the IAS 37 p. 53: *Where some or all of the expenditure required to settle a provision is expected to be reimbursed by another party, the reimbursement shall be recognized when, and only when, it is virtually certain that reimbursement will be received if the entity settles the obligation. The reimbursement shall be treated as a separate asset. The amount recognized for the reimbursement shall not exceed the amount of the provision.* Certainly, the requirement of certainty is a very demanding one, but with a counterparty such as the government, it can be satisfied.

Conclusions

The mining industry has accumulated significant experience regarding managing decommissioning liabilities. Given the complexity of the issue and its importance for reported financial results, it has represented a demanding challenge both for managers and accountants. Two problems have been evidenced as subjects of controversy:

- ◆ what kind of discount rate should be applied to actualize cash flows needed to settle decommissioning liabilities, or broader, how to include a risk factor into computations;
- ◆ how to recognize the value of post-retirement assets, or more broadly, how to manage these assets to maximize a mining project's value.

Both problems are clearly seen from an accounting perspective but relate to the management of the final, closure phase of a mining project. Analyzing the former issue, the mining industry comes to the conclusion that discounting techniques cannot be applied to recognize risk factors. Consequently, companies should use a risk-free discount rate and seek another method to reflect uncertainty in calculations. In the case of the latter issue, mining companies may choose to change their approach to the sustainability issue, taking a more proactive approach to their post-retirement, treating them as a potential source of substantial economic benefits.

The ESG policies substantially increased the number of industries dealing with the decommissioning challenge. Among them, renewable energy sources should be noted, as typically they are considered environmentally friendly, but in fact, after completion of projects, they leave hazardous materials as well as transformed land. This risk has already been recognized, and in several countries, work is being carried out to codify decommissioning practices. Experience of the mining industry offers considerable insight to be used by both companies and regulators.

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MANAGING VALUE OF DECOMMISSIONING OBLIGATIONS IN MINING INDUSTRY – FINANCIAL REPORTING PERSPECTIVE

Keywords

managing mineral resources, sustainable mining management,
mine closure process, decommissioning liabilities, financial reporting

Abstract

This article presents the evolution of financial reporting regulations and practices regarding decommissioning liabilities with a focus on the managerial approach to value creation processes in mining companies. Firstly, the author demonstrates the importance of provisions for the above-mentioned obligations for their overall financial standings. Then an analyses of the US and European financial reporting regulations from 1999 up to recent developments is provided to identify two fundamental challenges, related to: (a) a discount rate that should be applied to actualize cash flows needed to settle decommissioning liabilities, or broader, to proper inclusion of the risk factor into computations, (b) value recognition of post-retirement assets or broader, efficient management of these assets to maximize a mining project and company value. It has been proved that discounting is not a proper technique to deal with uncertainty of cash flows needed to settle decommissioning obligations, as mirroring a recognized practice applied for investment projects leads to results which are not only counterintuitive but significantly underestimate their current values. Therefore, a risk-free rate should be applied, and other methods must be developed to include uncertainty factors into computations. With respect to post-closure asset management, consequences of accounting

treatment of gains from asset disposal have been analyzed. A need for adopting a broader perspective encompassing non-mining-related use of such assets in the ESG context was indicated. The article also demonstrates the value of mining industry experience for other industries facing similar problems, like renewable energy.

ZARZĄDZANIE WARTOŚCIĄ ZOBOWIĄZAŃ Z TYTUŁU LIKWIDACJI KOPALŃ W GÓRNICTWIE – WYZWANIA W OBSZARZE RAPORTOWANIA FINANSOWEGO

Słowa kluczowe

zarządzanie zasobami mineralnymi, zrównoważone zarządzanie w górnictwie,
proces zamykania kopalń, zobowiązania z tytułu likwidacji zakładu górniczego,
sprawozdania finansowe

Streszczenie

W niniejszym artykule przedstawione są ewolucja przepisów i praktyki sprawozdawczości finansowej dotyczących zobowiązań związanych z likwidacją zakładu górniczego ze szczególnym uwzględnieniem zarządzania procesami tworzenia wartości w przedsiębiorstwach górniczych. Po pierwsze, podkreślono znaczenie rezerw na powyższe zobowiązania dla ogólnej kondycji finansowej przedsiębiorstw. Następnie przedstawiono analizę amerykańskich i europejskich regulacji dotyczących sprawozdawczości finansowej od 1999 roku do najnowszych projektów zmian. Zidentyfikowano dwa podstawowe wyzwania, dotyczące: (a) stopy dyskontowej, którą należy stosować w obliczeniach do aktualizacji przepływów pieniężnych dla zaspokojenia zobowiązań związanych z likwidacją kopalń – lub szerzej – do właściwego uwzględnienia czynnika ryzyka błędu szacunku ich wysokości, (b) rozpoznawania wartości pozostałych po likwidacji aktywów lub szerszej, efektywnego zarządzanie tymi zasobami, aby zmaksymalizować wartość projektu, a przez to przedsiębiorstwa górniczego. Wykazano, że dyskontowanie nie jest właściwą techniką uwzględniania błędu szacunku przepływów pieniężnych potrzebnych do rozliczenia zobowiązań związanych z likwidacją, ponieważ przeniesienie uznanej praktyki stosowanej przy projektach inwestycyjnych prowadzi do rezultatów, które nie tylko są sprzeczne z intuicją, lecz także znacząco zaniżają bieżącą wartość tych zobowiązań. Dlatego należy stosować stopę wolną od ryzyka oraz opracować inne metody uwzględniające czynnik niepewności w obliczeniach. W odniesieniu do skutków rachunkowego zarządzania aktywami po zakończeniu wydobywania przeanalizowano konsekwencje obowiązujących regulacji dotyczących raportowania finansowego w odniesieniu do rozpoznawania korzyści ze sprzedaży takich aktywów. Wskazano potrzebę przyjęcia szerszej perspektywy obejmującej wykorzystanie takich zasobów niezwiązanych z górnictwem w kontekście zrównoważonego rozwoju (ESG). W artykule pokazano również wartość bazy doświadczeń zgromadzonych w górnictwie dla innych branż borykających się z podobnymi problemami, takich jak branże odnawialnych źródeł energii.