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The Importance of "Social License to Operate" for the Mining Life Cycle

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Abstract

At the Annual Conference of the Society for Mining, Metallurgy and Exploration (SME) in February 2020 in Phoenix, Arizona, the debate on the term "social license to operate" was a focus. The title of the keynote session of the annual conference was: "The Executive's Role in Tailings Management: Preserving our Social License to Operate".

In view of the recent accidents at mine tailings dams, the mining industry itself must revisit its "social license to operate" or, in other words, its responsibility as an operator and public acceptance of its business. A recent tailings dam breach occurred in January 2019 near the Brazilian city of Brumadinho. The massive tailings spill from the Córrego do Feijão iron ore open-cast mine claimed more than 270 victims, polluting the downstream environment with a sludge volume of almost 12 million cubic meters. Extensive examination of this disaster, along with many similar incidents in recent history, made clear that mining companies must urgently address the safe operation of tailings ponds at the top executive levels. Those responsible must recognize that "business as usual" is no longer an option. Simply relying on a government issued mining permit covers the technical aspects of mining and processing no longer suffices, as the mine operator must consider a wider range of stakeholder inputs and concerns to obtain social license.

This paper examines how mines can operate sustainably in the broadest sense and which efforts are required to ensure public acceptance throughout the mine life cycle. Results show that socially responsible operation requires that mining processes must be fully disclosed, including the results of long-term geomonitoring.

1 Introduction

As an industry of primary production, mining and its products are at the start of value chains. Mining satisfies the raw materials needs for the global population. With the predicted growth to almost 10 billion in 2050, the demand for raw materials is expected to increase about proportionally, although technological progress is expected change the raw material mix. Personal experiences of consumers with mined, processed and end products such as buildings, automobiles and electronics is becoming increasingly decoupled from the raw materials industry: consumers no longer recognize that their cell phone contains 70 or more different mined products. In other words, the public has little experience with the life cycle of a mine (Fig. 1).

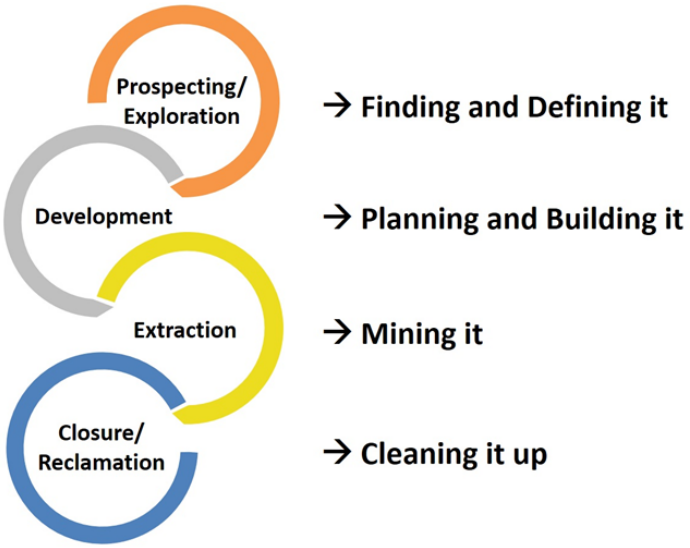

Figure 1: *Life cycle of a mine (according to Stanley et al. 2015).*

This decoupling in the understanding of technical and scientific processes leads to a vanishing sense of responsibility: the public no longer recognizes that its consumer behaviour necessitates mining. At the same time, governments and non-government organizations are rethinking their approach to climate and environmental protection in light of social change and the challenges of digitalization (WBGU 2016). Many societies promote closed-loop recycling, which also has the additional effect that the extraction of raw materials, which is always necessary for closed-loop recycling management, is receding into the background (Hiebel et al. 2017 & Müller et al. 2020). However, the effects of mining processes on the people living in the neighbourhood and the environment become visible in the media. Mining is repeatedly pilloried and it is often difficult for companies to communicate with the public in a timely manner based on facts and to make operational decisions transparent.

Fierce disputes about the location and method of mining mineral resources and the organisation of supply chains cause many problems. (BMZ 2017). The natural limitations of deposits limits mining sustainability, yet the industry must still be held accountable for its ecological, social, and economic impacts. Urged by accidents at processing plants and tailing ponds, the Science Policy Report of the Academia Brasileira de Ciencias and Leopoldina, are refocusing their attention towards more sustainable mining practices and encouraging legislators, mining companies, the scientific community and the public to join (Apaestegui Campos et al. 2019).

The "social license to operate" is key for integrating sustainability in mining. This describes an essential basis of mining activities and must be defined from different perspectives. For the companies, this term covers the operator responsibility, or the operating licence throughout the entire mining life cycle. The company acquires this license on the basis of permits, environmental impact studies, geomonitoring, and risk management systems, but also by building public confidence The general public and key stakeholders grant social or societal operating licence to the company based on the company's reliability, trust, communication and transparency. Establishing an integrated and

continuous geomonitoring system for the entire mining cycle creates transparency and allows for open communication about results monitoring with stakeholders.

From the perspective of sustainability and the conservation of the natural basis of life, two fundamental processes for mining can be identified in the context of forces, forms and values (Fig. 2) (WBGU 2016).

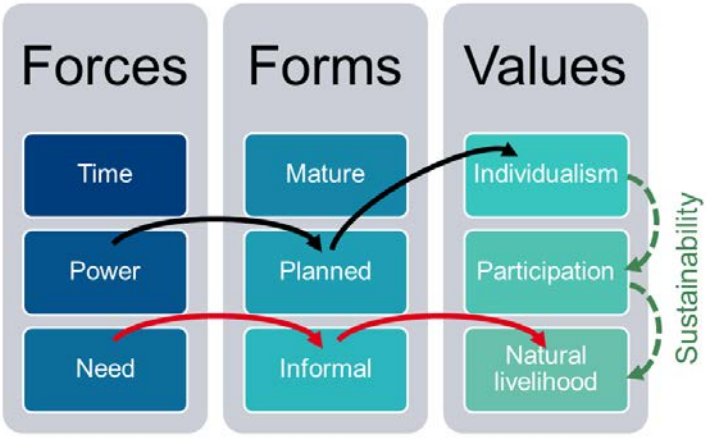

Figure 2: *Scheme of dominant global processes in mining in terms of forces, forms and values (WBGU 2016).*

Historically simple, early mining, still practised today in the field of artisanal mining starts from the existential need to preserve the basis of life depicted by the red line in fig. 2. In a further developed, industrially dominated mining life cycle, the mining industry assumes a position of power and planned entrepreneurial action through actions such as strategic location acquisition shown in the black, solid line in fig. 2. Integrating modern concepts of social operator responsibility allows affected parties to participate, which in turn leads to an improvement in the natural basis of life, which means greater sustainability, show by the green, dotted line in fig. 2. Because a social licence to operate means also a greater sustainability.

Recent impressions from the USA have prompted the authors to expand risk management to include the challenge of maintaining and improving reputation and social acceptance. The article aims to stimulate a broader discussion in our industry and to provide factual arguments.

2 The SME Conference 2020 in Phoenix/Arizona

The Society for Mining, Metallurgy and Exploration– (SME) - is one of the largest mining-oriented associations with over 12 members worldwide (SME 2020). "MineXchange", the theme of SME's February 2020 conference in Phoenix, Arizona, aimed to highlight changes in mining and the importance of sharing ideas and knowledge (Goerke-Mallet

et al. 2020). The globally attended conference offered opportunities for networking and updated information exchange. The exhibition with its more than 700 participating companies, organisations, and institutions complemented the informative and extensive lecture programme. A conference of this magnitude requires numerous supporters. The Phoenix-based company Freeport-McMoRan, for example, took over the sponsorship of the entire conference. The keynote session was "The Executive's Role in Tailings Management: Preserving our Social License to Operate", a highly dedicated discussion (SME Annual Conference 2020).

Mining companies facing increasing number of dam bursts at sludge pond sites must develop more effective waste processing solutions. During a panel discussion, four top managers from the mining companies Consol Energy, Freeport-McMoRan, Mosaic Kali and Newmont-Goldcorp presented their views on the problem and the operational handling of tailings ponds. The aim was to find out which changes in the management of companies are considered necessary in order to avoid incidents in the future. How can risks of reputation loss be reduced and how can public acceptance of mining be maintained?

Statistically, two incidents per year have occurred at tailings ponds over the past fifty years, yet the scale of the incidents has increased in terms of the amount of sludge released and the number of victims (WISE 2020). In January 2019, the dam bursting in a tailings pond of an open-cast iron ore mine near the Brazilian city of Brumadinho claimed more than two hundred and seventy victims and the environment was severely polluted by a sludge volume of almost twelve million cubic metres.

The recent catastrophic effects of dam bursts at mud ponds in Brazil and Canada, among others, have massively damaged public confidence in the reliability of mining and have led to a tightening of official requirements and controls. Several conference contributions showed that mining companies are recognising the economic importance of the social and environmental expectations of their stakeholders (SME Annual Conference 2020). The integration of new approaches and technologies into operational activities in the areas of environment, safety, health and social affairs, as well as substantial risk management, is perceived as a competitive advantage.

It is also important to establish an integrated and continuous geomonitoring system for the entire mining cycle. For this geomonitoring, different methods must be applied, depending on the issues involved, but the respective results must be considered and evaluated integrally (Rudolph et al. 2020). In the geomonitoring of tailings ponds, it is not sufficient to use only remote sensing data, such as Sentinel-1 data from the EU-Copernicus programme on ground movement, inspections and in-situ sensors should also be used. This is the only way to ensure early detection of potential problems and their validation.

For mining projects that are in an early stage of development, the public and stakeholders must be involved in planning considerations from the beginning (Lerch 2020). A holistic approach may initially complicate project management and external project communication, but it will ultimately result in a more robust acceptance of the project.

Considerable developmental efforts such as creation of transparency and permanent communication are still required for sustainability. Both the scope and depth of treatment challenges associated with ensuring the operational safety of sludge ponds reveals the risk awareness of the industry. Given the developments of recent years, there can be no "business as usual". At no time, incidentally, was there any impression that the treatment of the topic was glossing over, i.e. that it could be an act of "greenwashing".

Risk management plays a central role in dealing with the safety issues associated with processing waste (Fig. 3). In order to be able to reliably assess the risks associated with the operation of mining facilities and to adjust the operating mode accordingly, the most comprehensive possible 4D-based (geo-)data, information and knowledge management is required. This is directly linked to the geomonitoring of the plant and its surroundings. The lecture presented by the authors of this paper and other experts at the conference was integrated into this context. It dealt with the use of data from satellite-based sensors to improve risk management in post-mining (Goerke-Mallet et al. 2020). Research projects are investigating which information can be used to detect ground movements, changes in soil moisture and vegetation, and to detect general changes in the dams and the sludge body of tailing ponds. The aim of the investigations is use data from, the European Copernicus programme for the early detection of safety-relevant changes in mining installations in all phases of the life cycle.

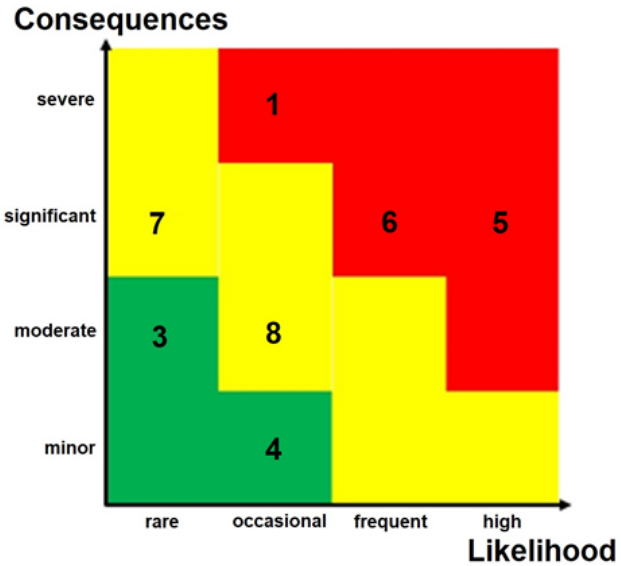

Figure 3: *Risk-management in mining: matrix of likelihood versus consequences.*

3 The term "social license to operate"

In the course of the discussions on the topic of "sustainability", the expression "license to operate" developed about two decades ago. This term reflects the reputation of a company and its social acceptance. In the absence of this "license", there are consider-

able doubts from the stakeholders associated with the company as to whether the business model or associated projects make sense. The willingness to cooperate with the company tends towards zero in this case.

From a business perspective, securing and strengthening the "operating license" leads to a positive atmosphere in which the company's strategy and its value creation can be implemented (Lin-Hi 2018). Socially accepted companies often succeed in achieving sustainability, which in the "Values" pillar of figure two, is achieved by moving from individuality to participation to the natural foundations of life. They deal very proactively with all economic, ecological, and social consequences of their actions. In this context, Löhr (2003 speaks about credibility of corporate action. He asserts, companies must be given time to gradually increase their own credibility. However, the process should not only be visible in the achievement of economic goals but rather in terms of the people and the environment.

The University of British Columbia in Vancouver, Canada, has been providing important impulses for the discussion of the social acceptance of mining activities for some time. For example, Nelsen (Nelsen 2007) investigated the conditions at several mines in different parts of the world. According to him, stakeholders in the mining industry are increasingly demanding greater involvement in decisions that directly affect them. Many companies learned that voluntary initiatives beyond legally regulated responsibilities are key in gaining acceptance. However, despite a high level of awareness of social acceptance in companies, there is no consensus on the use effectiveness of social awareness (Nelsen 2007). Additionally, success of social acceptance is largely based on establishing and maintaining sustainable relationships with stakeholders. The participatory approach is fundamentally important.

The "social license to operate" was originally used as a pictorial expression to draw attention to the positive integration of the company into the surrounding structures (Black 2013). This has now become a system for managing tasks in difficult times. This strategy is aimed at stakeholders and the handling of complex socio-political structures. Ultimately, every company needs to consider social issues (the human factor) and the environment and, therefore, needs to use this strategy.

The oil and gas industry (E&P) in Germany is an example. Wintershall DEA combines operator responsibility with digitalisation, resulting in a more transparent, aligned corporate culture that delivers almost unlimited access to information and cross-company cooperation. The development initiated with digital tools is driven by both top-down and bottom-up approaches (DGMK 2020). For example, the employees at Wintershall DEA are asking more intensively about the purpose of their work and about their responsibilities and competencies. Discussions about the social acceptance of companies and their actions have increasingly integrated sustainability (BMU 2017). In 2016 the United Nations intensified and expanded the debate on the sustainable management of operational processes by formulating seventeen sustainable development goals (Engagement Global 2019. In all sectors of primary production and especially in mining, critical questions from the public and stakeholders must be addressed. This is the context of a study by Kleiner (2016), who uses the term "economic ethics".

The Seventeen Goals relate to primary production in mining and are vital to achieving sustainability goals. Raw materials form the basis for production processes and deposits should be used sustainably and efficiently as population and economic growth increase resource need.

How can the mining industry apply these ethical and moral demands and significantly increase standards towards operational processes? Or, can mining still operate ethically, and what is its social license to operate?

Mining should be carried out responsibly and within the corridors defined by the Seventeen Goals. Mining processes often have at least a temporary impact on nature and the landscape and often cause irreversible changes. Since mining deposits have finite volume, they are not sustainable. However, the mining industry contributes actions to achieve these goals in many areas, such as environmental impact studies (Goerke-Mallet 1999). Operational safety and communication processes must comply with standards. This includes constant monitoring of raw material extraction and limiting its negative effects. Regional population participation in economic and informal terms, for example in the form of stakeholder meetings and community engagement in planning is also paramount (Apaestegui et al. 2019).

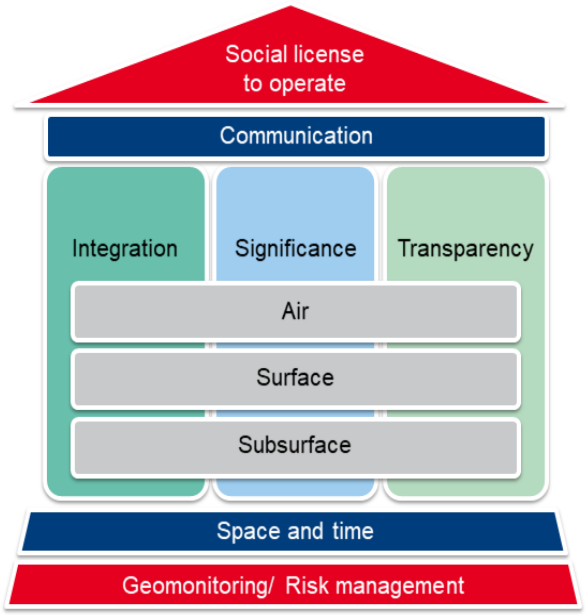

Figure 4: *The double triad of geomonitoring as a basis for communication and social operator responsibility.*

Limiting the influence of raw material extraction, while simultaneously increasing sustainability can be achieved through geomonitoring (Fig. 4). Completely integrating digital methods from the air (e.g. satellite, aerial survey, drone), at the surface (e.g. inspection, in-situ sensors), and underground (e.g. borehole geophysics) creates a transparent understanding of processes in space and time. Thus, geomonitoring represents an essential basis for social operator responsibility.

In order to meet the challenges of the mining life cycle and the post-mining phase, the Research Institute of Post-Mining (FZN) at THGA has developed an integrated approach, that covers four research areas (Kretschmann 2020): (a) Eternal tasks and mine water management, (b) geomonitoring in old and post-mining areas, (c) material sciences for the preservation and new use of the industrial heritage, and (d) reactivation and transition (Fig. 5).

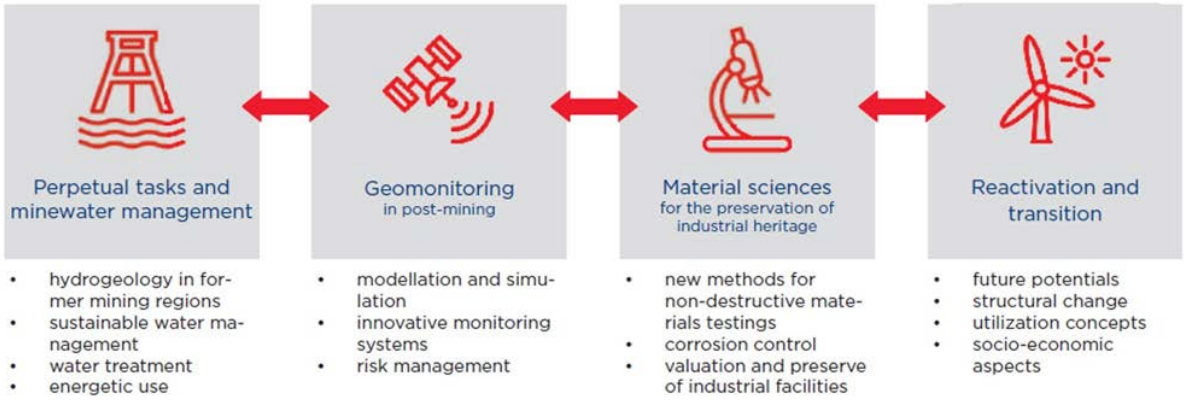

Figure 5: *Research areas of the Research Center for Post-Mining at the Technische Hochschule Georg Agricola University.*

These four research areas cover the requirements that have to be met for a responsible and sustainable use of Earth's resources.

The mining industry's approach to supply chain due diligence poses another opportunity for investigation. Pateiro Fernandez (2008) speaks of the development of site-specific approaches to interpreting the sustainability paradigm and refers to the specific reaction to existing framework conditions. The goal is to minimize negative impacts on the environment and society while maximizing social and economic factors. Participation, which is an integral part of the sustainability concept, should result in social acceptance of mining measures. Consideration can also be given to the Equator Principles used by banks in project financing (World Bank Group 2019). It is a voluntary set of rules based on the environmental and social standards of the World Bank.

In summary, a sustainable mining process is only sustainable if the use of deposits is sustainable. It must therefore take equal account of economic, ecological and social aspects. A development is only sustainable if its actions are based on facts, and sufficient transparency is created through communication with every stakeholder.

Public acceptance of mining projects must relate to the entire mining life cycle. The specific spatial and temporal conditions of mining and its dynamic mode of operation create challenges for maintaining per credibility and reliability of developers with the public. Communication with the public about processes and results is key, and achieved through continuous monitoring. (Fig. 6).

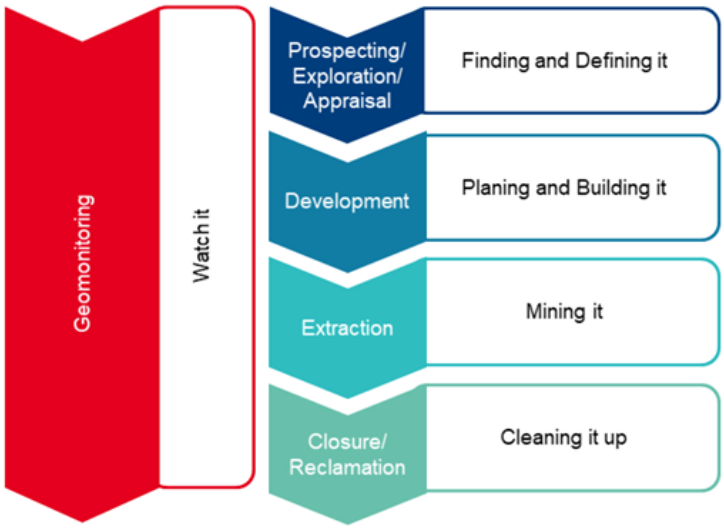

Figure 6: *Geomonitoring in the mining life cycle (according to Stanley et al. 2015).*

Shell Oil's Brent Spar platform developments present an example of typical stakeholder disputes. The Brent oil field is in the North Atlantic between the Shetland Islands and the Norwegian coast, west of the city of Bergen. The platform was built in 1976 as a floating oil tank and loading facility and was shut down in 1991, as pipelines for oil and gas had taken over the logistical tasks. Shell planned to sink the Brent Spar in a deep-sea trench west of Ireland in 1995. In April 1995, Greenpeace occupied the platform to prevent the sinking, setting a new precedent (Greenpeace 2020). After many years of examination involving relevant institutions, the sinking was approved by the British authorities. Under pressure from the public and the boycott of German petrol stations, Shell decided, in June 1995, to scrap the Brent Spar on land. A few months later Greenpeace admitted that it had disseminated information that exaggerated the amount of oil residue in the tanks of Brent Spar. A public apology followed, but this had no impact on the loss of reputation of either the oil company or the environmental organisation.

The Brent oil field has been almost depleted for several years and dismantling of the four remaining drilling platforms is underway. More than three hundred studies have been carried out, one hundred and eighty organisations and four hundred individuals have been involved in the study of the fate of the support structures in the sea. Clear guidance for the disposal is still not available. The problem lies in oil residues in the tanks that are built into the support structures and in the risk of an environmental pollution. Besides the British government, the fifteen signatory states to the Treaty for the Protection of the North Sea and the North Atlantic (OSPAR) are also involved in the decision-making process (Süddeutsche Zeitung, 2020). The example reveals the complexity of communication and transparency in relation to corporate and political decisions. It also shows how important it is to emphasise the need for fact-based action on all sides. The developments surrounding oil and gas production in the Brent field cannot undermine efforts to pursue the goals of sustainability. The mining experts should rather derive positive impulses from this certainly very difficult case.

4 Conclusions

In the mining life cycle, consideration of operator social responsibility is becoming increasingly important. Severe tailings dam failures have brought this consideration into the public eye. Technical changes in society, including digitalisation, and the change towards a circular economy are causing a technical re-thinking among the public that goes along with a decline in acceptance and technical understanding of mining. In order to increase acceptance and create broader understanding, mining companies must become open, transparent and invite public participation. Project management must including comprehensive geomonitoring and external project communication. Geomonitoring that is fully integrated into the mining life cycle is a key to the success of operator social responsibility in mining.

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