



Risk management in the hard coal mining industry: Social and environmental aspects of collieries' liquidation

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ABSTRACT

In this article, the problem of environmental and social risk management during the process of colliery liquidation is considered. The identification and assessment of the sources of this risk was conducted on the basis of a review of international case studies and hard coal mining restructuring in Poland from 1993 to 2012. On the basis of conclusions from the analyses, basic assumptions were elaborated concerning the conception of environmental and social risk management during the process of colliery liquidation. Such a conception is based on including the sustainable development and corporate social responsibility in the total system of risk management in a mining enterprise. The approach presented in the article – considering the scale and extent of social and environmental effects of colliery liquidation – makes the internal decision-makers, as well as external stakeholders, aware of the necessity of undertaking anticipatory activities aimed at the reduction of social and environmental risks and effects during colliery liquidation.

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Introduction

Hard coal mining is a major industry on every continent. In Europe, it is declining; in America and Australia, it has been successfully functioning for years; and in Asia and Africa, it is in a phase of dynamic development. Different life horizons for this industry result from a few basic objective circumstances, such as deposits' abundance, geological mining conditions, production costs, and subjective circumstances—for example, strategic significance of energy safety, workplace maintenance, attitudes towards renewable energy sources, and ecological policy (Malko and Wojciechowski, 2007).

Hard coal mining is an important industry for the global economy's development, owing to the rising energy needs and still-high share of hard coal in meeting these needs (Lorenz and Grudziński, 2009; Martin-Amouroux, 2008). The place of hard coal mining in global economics is still determined by a high and increasing share of this resource in satisfying the world's energy needs (Chart 1).

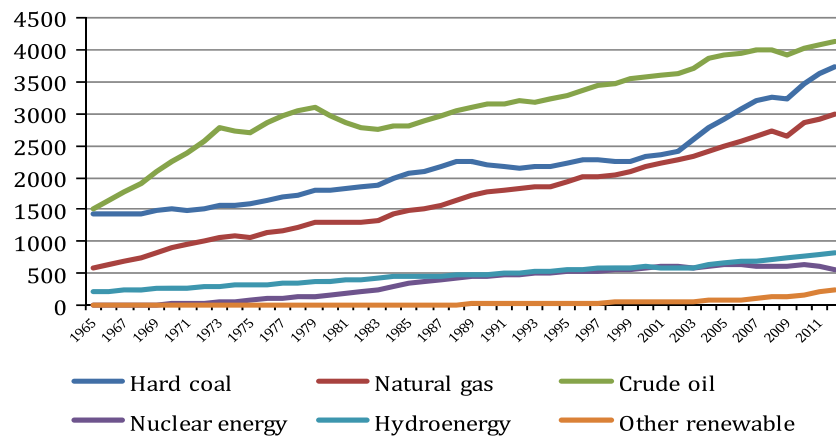
According to Chart 1, hard coal is the second largest source of electric energy in the world after crude oil (Gao and Sheble, 2010). Its share in satisfying the world's energy needs has been systematically increasing since 2001. In 2012, it equalled 29.90%, coming close to the share of crude oil, which then amounted to 33.11%. The dominant consumption of this resource is in Asian countries

(approximately 70%). Significant amounts are also used in North America (approximately 13%), Europe, and Eurasia (approximately 14%) (BP Statistical Review of World Energy, 2013).

Despite an undoubtedly significant role of the mining enterprises in meeting the energy needs, their operations are subject to risk of an extraordinary scale and extent. This concerns both the specific risk (referring to the interior of the enterprise) as well as systematic risk (related to the functioning of the enterprise in the more immediate and more removed environment). Among the sources of specific risk that do not occur in other manufacturing enterprises, natural hazards should be mentioned: gas, dust, rock burst, water, seismic, climatic, radioactive, and microbiologic (Wodarski and Popczyk, 2011). The enhanced risk of accidents at work and occupational diseases among the crew of the collieries is also related to these occurrences. This causes an intensification of social and environmental sources of risk (Ściężko and Zuwała, 2007). All of the aforementioned factors cause the mining operations to be regulated by separate, specific legal provisions, which are related to the increased scale and extent of legal risk. It is also worth adding that the realisation of the aforementioned risk sources as well as their associated occurrence causes, above average, financial losses in the operations of the enterprise and in its environment, which also means an enhanced level of financial risk (Michalak, 2011).

Currently, due to a very strong negative influence on the natural and social environment, it is a branch of industry that generates increasing controversy. The extent and scale of this negative influence changes during the course of the colliery life

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Source: Author's work based on the data of *BP Statistical Review of World Energy*, June 2013.

Chart 1. Worldwide energy sources in the years 1965–2012 [in millions of t of oil equivalent].
Source: Author's work based on the data of BP *Statistical Review of World Energy* (2013).

cycle, which encompasses the stages of commissioning, operations, and decommissioning. However, it is not always possible to eliminate these hazards through the positive aspects of mining operations in the form of new workplaces and economic development of the given region. To illustrate these issues, the key sources of negative and positive social and environmental interactions in the stages of the colliery life cycle are presented in Fig. 1.

A threat to the life and health of the employees in the stage of exploitation and the reduction of employment after the liquidation of the mining enterprise are undoubtedly among the most serious social effects of the operations of collieries (Rakowska and Cichorzewska, 2012; Parchański, 2007). The accumulation of these hazards may contribute to the deterioration of social relations in a particular region (Calvano, 2008) and to its substantial impoverishment (Hilson and Yakovleva, 2007). Meanwhile, the intensive environmental hazards accompany practically all stages of the collieries' operations and remain for many years after decommissioning (Mishra et al., 2012; Mayes et al., 2006). Among the most dangerous are such hazards as mining damages, emissions of gas and dust, and disruption of the hydrosphere balance (Lord and Manson, 2011).

Despite the numerous environmental and social controversies (Slack, 2012; Veiga et al., 2001) related to the mining industry, the current trends in the area of hard coal consumption (Chart 1) make it clear that the problem of the collieries' operations is still important and current. This is especially so, as the sufficiency of the global reserves of this resource in Europe, Eurasia, and North America, at the current level of consumption, exceeds 240 years. In Asia, the sufficiency of hard coal deposits is estimated to be approximately 50 years (BP *Statistical Review of World Energy*, 2013). The value of these reserves is presented in Chart 2.

The presented retro- and prospective data confirm a strong position of hard coal as an energy resource (Lorenz, 2011; Olkusi, 2011). Hard coal mining plants (collieries) are therefore enterprises of a quite stable position in the global energy industry and economy. Thus, raising the topic of environmental and social risk analyses and assessments accompanying their activities is a current and far-reaching issue, not only from the point of view of collieries' existence, but mostly from a perspective of providing the possibility of sustainable development (Boiral and Gendron, 2010), which is a condition for the harmonic co-existence of all participants in the environment (Hilson, 2012; Delmas and Toffel, 2004; Cragg and Greenbaum, 2002).

This paper examines only a part of the extensive problem of risk management in a colliery, particularly the liquidation stage with its accompanying natural and social hazards (Brzychczy, 2011). This stage is not significant in the literature that primarily takes a complex and prospective approach to risk management. This stage is treated as the least vital in a mining enterprise because of the lack of current economic benefits that are specific for this stage.

In the previous research concerning the stage of collieries' liquidation, there are several basic research trends and approaches. The social and environmental issues are most often examined jointly, and usually their analysis involves descriptive case studies in which the social or environmental effects of collieries' liquidation are presented in the *ex post* approach (Mutti et al., 2012; Campbell and Roberts, 2010; Li, 2009; De Jongh, 2004; Hamann, 2004). In the countries and regions where mining is or used to be an industry of strategic significance, the social and environmental aspects appear in a context of enterprises and industrial regions' restructuring (Turek, 2007; Kuźnik, 2003; Turek, 2003; Karbownik and Bijańska, 2000). Along with the development and popularisation of the conception of sustainable development and corporate social responsibility, the discussion of the possibility and purposefulness of their application in the mining industry appears (Lewandowski, 2012; Coumans, 2010; Hamann, 2003; Hilson and Murck, 2000). A relatively small number of publications on the social and environmental aspects of collieries' liquidation is of the *ex-ante* character analysis or concerns a complex risk management using sustainable development of the mining enterprises.

Taking into account the circumstances above, in this article the problem of social and environmental risk management is raised in the stage of colliery liquidation. The main objective of the article is to identify and assess the social and environmental hazards accompanying the collieries' liquidation and to indicate the tools necessary for taking actions aimed at reducing the effects of these hazards. The structure corresponds to the subsequent stages of risk management that include risk identification and assessment as well as risk prevention connected with its control.

To achieve the objective as formulated, in the first part of the article there is a review of international case studies concerning the functioning and liquidation of the mining enterprises along with an extended analysis of the effects of collieries' liquidation in Poland in the hard coal mining restructuring process. The research

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