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A SWOT analysis of environmental management practices in Greek Mining and Mineral Industry

I.E. Nikolaou [a], K.I. Evangelinos [b,*]

[a] Department of Environmental Engineering, Democritus University of Thrace, 67100 Xanthi, Greece
[b] Department of Environment, University of the Aegean, 81100 Mytilini, Greece

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ABSTRACT

Over the last two decades, mining and mineral exploration companies have adopted various environmental management practices in response to society's pressure for better environmental protection. The literature highlights a number of benefits and challenges for companies adopting environmental management practices with the Greek Mining and Mineral Industry (GMMI) facing similar issues. In order to analyze the challenges faced by the GMMI, a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was conducted, which examined the strengths, weaknesses, opportunities and threats faced by the industry when adopting environmental management practices. The analysis prescribes policy recommendations both for the government and industry which, if adopted, could facilitate improved environmental performance.

Introduction

In an effort to promote cleaner production and environmental management tools in the mining industry, certain countries – both industrialized and industrializing – have revamped sector-specific environmental regulations. On one side, industrialized countries such as Canada and the USA have enacted strict environmental regulations for mining companies such as the Resource Conservation and Recovery Act and the Surface Mining Control and Reclamation Act (Hilson, 2000a). On the other side, industrializing countries have also prepared environmental regulation but there are some important weaknesses such as a lack of clear, supportive plans for facilitating waste minimization and incompleteness of present regulatory frameworks.

To respond to these increasing environmental regulations, mining and mineral companies have adopted environmental management practices. These have helped companies minimize their impacts on the environment. For instance, Suppen et al. (2006) refer to certain Mexican mining companies that have adopted environmental management tools with very significant environmental improvements. In the same sense, Newbold (2006) pays more attention to holistic environmental management systems (EMSs), which "*are designed to help [mining] companies manage their environmental responsibilities and liabilities*". Apart from deriving environmental benefits, authors also examine the relationship of these practices with accountability issues. Driussi and Jansz (2006) highlight that the adoption by Australian mining companies of specific management practices such as environmental management systems (EMSs), pollution control technologies, environmental education programs for staff and other strategies may assist them to improve their accountability in relation to environmental issues.

The lessons of other countries on the benefits and obstacles of environmental management practices are followed in different ways by the Greek Mining and Mineral Industry (GMMI). Recently, several Greek medium and large-scale mining companies have introduced environmental considerations into their strategic management as a result of the current environmental regulatory framework as well as in response to society's requirements for environmental quality maintenance. The Greek mining industry has responded to these challenges by introducing environmental management practices or holistic environmental management systems mainly to restore environmentally depreciated operation sites, by eliminating the use of environmental resources, managing waste production, eliminating water use and

* Corresponding author. Tel.: +30 2251 0 36292; fax: +30 2251 0 36254.
E-mail addresses: inikol@env.duth.gr (I.E. Nikolaou), kevag@aegean.gr (K.I. Evangelinos).

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controlling other environmental impacts. By implementing such management practices, some members of the GMMI state, in environmental reports and internet sites, that the environmental management practices they adopted have assisted them to gain '*the social licence*' to operate from local communities. However, there are a significant number of obstacles to the implementation of such practices, including short-run compliance costs and a low level of environmental awareness by staff. Thus, this paper utilizes a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis to examine the strengths, weaknesses, opportunities and threats for the GMMI in implementing environmental management strategies. The data were taken from the environmental reports of GMMI and annual environmental reports published by the Greek Association of Minerals and Mining Industry. Finally, the results of this method are utilized to prepare specific environmental policies for the GMMI.

The remainder of the paper is divided to the following sections: (a) the global experience regarding mining and mineral environmental management practices is described in the *Environmental management practices of the mining and mineral industry: a short review of the global experience* section, (b) the Greek experience of mining and mineral environmental management practices is presented in the *Environmental management practices of the mining and mineral industry: the Greek experience* section, (c) the basic steps of methodology are demonstrated in the *Methodology* section, including the steps of the analysis, sample selection and the SWOT analysis, (d) policy recommendations are presented in the *Policy and strategies recommendations* section and (e) conclusions are discussed in the *Conclusions* section.

Environmental management practices of the mining and mineral industry: a short review of the global experience

Environmental management practices can be divided to two major categories based on the mandatory or voluntary character of the driving forces. The first category encompasses the environmental management practices of the mining companies resulting from the pressure from 'command and control' and 'market-based' instruments. The second category includes those environmental management practices that the mining industry adopts on a voluntary basis.

Furthermore, another useful distinction for environmental management practices is the period in which these practices are applied, namely *ex ante* or *ex post* environmental management practices. The environmental management practices of the mining companies to restore the physical environment are applied at the end of the production process and could be considered as *ex post*. This category includes environmental management practices based mainly on the idea of the rehabilitation of mining environmental damage and is principally a result of the regulatory regime, thus may be considered as reactive actions. The other category encompasses environmental management practices that mining and mineral industries adopt to maintain a good level of environmental quality and can be classified as an *ex ante* practice and may be considered as more proactive. Although this distinction is very difficult to define in the case of the mining industry, it may be a useful framework for making relevant literature clearer and manageable.

Following this rationale, Table 1 indicates the basic mining and mineral environmental management practices. The rows illustrate the environmental management practices of the mining industry as a result of either mandatory or voluntary measures, while the columns classify these practices according to the period in which they are applied. In particular, the first quadrant (A) includes mining environmental management practices as compliance with environmental regulatory requirements to predict environmental impacts (*ex ante* activities). The second quadrant (B) relates to an environmental regulatory framework like the Comprehensive Environmental Response, the Compensation and Liability Act (CERCLA) and the European Mine Waste directive, which classify companies according to the costs of restoration and rehabilitation after environmental damage has taken place. The third quadrant (C) includes voluntary environmental management practices like environmental management systems that mining companies adopt to assure environmental quality. Finally, the last quadrant (D) indicates voluntary environmental activities that are implemented at the end of the extraction procedures or general production procedures.

Table 1
Environmental management practices of mining and mineral industries.

	Environmental management practices		
	Ex ante (A)	Ex post (B)	Authors
Mandatory measures	• Environmental management plan • Environmental impact statement report (C)	• Rehabilitation of mining sites • Restoration of ecosystems • Payment of fines • Payment of taxes • Waste management activities • Water restoration activities (D)	Annandale (2000), Annandale and Taplin (2003), Macedo et al. (2003), Ghose (2003), Patarmatzi et al. (2005), Damigos (2006), Evangelinos and Oku (2006), Sarrasin (2006)
Voluntary measures	• Environmental management systems • Life cycle assessment • 'Cradle to grave' analysis • Environmental accounting • Environmental indicators	- Rehabilitation of mining sites,- Restoration of ecosystems,- Investment in local societies projects,- Report environmental performance.	Bomsel et al. (1996), Santos and Zaratan (1997), Hilson and Murck (2000), Peck and Sinding (2003), Azapagic (2004), Jenkins (2004), Mutagwada (2006), Newld (2006), Jenkins and Yakovleva (2006), Suppen et al. (2006), Durucan et al. (2006), Mudd (2007), Carrick and Kruger (2007)