

Sustainable Development Concept in Mining Sector

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ABSTRACT: In this study, first of all the definition of sustainable development is made and the awareness of environmental, social and economic issues in the public for diverse sectors and mining have been reported. Then, the literature examining the applicable sustainable development in the corporate mining context at national and international scales are studied and the sustainable development agendas for mines have been investigated. Finally, the steps that a mine must take in order to improve the sustainability of the operations are emphasized improving the social and economic satisfaction in association with the necessary environmental conservation and several recommendations have been proposed for this purpose.

1. INTRODUCTION

It has become a prominent concern among the public in the recent years to focus more on the environmental impacts of several industries and for this purpose, many conferences were held in different parts of the world in the last decade to argue and find immediate solutions to environmental and socioeconomic issues. A major outcome of these meetings, The Brundtland Report, which was published in 1987, compelled the governments and the industries pay more attention to environmental problems and socioeconomic responsibility. This report has brought into agenda a brand new concern - sustainable development for the first time. Sustainable development can be defined as meeting the needs of the present time without risking the requirements and sources of the future generation (WCED, 1987). The term "sustainable development" functions to integrate the needs of economy, environment and society by finding solutions in the common ground for all parties. Sustainable development is generally the combination of improved socioeconomic growth, advanced

environmental protection and pollution prevention. Other definitions presented up to date are given in Table 1 (Barrow, 1999).

After the realization of sustainable development by a wide range of companies and governments, they began to make commitments more to these issues and consult the spirit of sustainable development as a guide in policy-making activities. One of the controversial industries that interfere with economic, social and environmental benefits is the mining sector. According to the sustainability policy that will be put into practice, the role and objectives of the government and also the strategies to keep sustainable development operational and fresh in the mining industry, certain initiatives should be taken up and implemented by the private sectoral part and governmental portion of mining. In this paper, the interpretation of sustainable development in the mining context is made and the key points are outlined about

how the companies and the governmental organizations would contribute to sustainable development.

Table 1. Diverse Definitions for Sustainable Development

* Environmental care "married" to development

* Improving the quality of human life while living within the carrying capacity of supporting ecosystems

* Development based on the principle of intergenerational inter-species and inter-group equity

* Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

* An environmental "handrail" to guide development

* A change in consumption patterns toward more benign products, and a shift in investment patterns toward augmenting environmental capital

2. INTERPRETATION OF SUSTAINABLE DEVELOPMENT IN THE MINING SECTOR

Although the Brundtland Report globally delineates the sustainable development, it fails to explain how to implement and continue it in the mining sector. This is because different countries will comprehend and achieve this term in a wide spectrum due to the variations in economic, environmental and political circumstances throughout the world (NRC, 1995). This vague characteristic of the report has urged in time several academics and industrialists to build a chain of guidelines and "indicator sets" in order to ease its implementation for diverse sectors. In an analogous manner, several experts related to mining have made precious attempts to outline exactly how sustainable development applies to mining activities and mineral-based commodities. Most of these interpretations seem to mention the nonrenewable character of mineral deposits and contamination effect of mine over the environment.

The term "sustainable development" is generally taken for the term "environmental protection" in mining. This creates frequently deceptive situations because, if it is only interchanged with environmental contamination then the 2 other components, economic and social aspects happen to be ignored (Da Graaf et al., 1996). This comes out because many of the previous sustainable development evaluations in the mining sector focus on the environment protection alone. For example, Carbon (1997) argued that in case environmental problems at a mine were significantly discarded, then the mining industry would contribute a lot to the sustainable development. Nonetheless, social benefits and economic aspects should be considered at least as important as the environment contamination. Only this concern has even become very helpful with regard to mining industry, and because of the rising sustainable development concept, environmental policies have become more comprehensive and stricter during passing years.

Many researchers have put forward theories that are based upon the nonrenewable nature of the mineral deposits as referred in the text before. One of the outstanding theories about this topic has been argued by Tilton (1996). He presented two different viewpoints on nonrenewable sources and sustainable development. The former opinion of him suggests that according to this trend, Earth will not be able to cope with the demands for minerals and other exhaustible resources in the future. This idea is rather skeptical about the future of natural resources

and attempts to calculate the time duration for any given commodity. The latter idea of Tilton is not concerned with resource exhaustion. Opposingly, it defends that particularly metallic ores are not entirely consumed but recycled or transformed into other forms. It also claims that since the easiest accessible deposits that are close to the surface are initially extracted, it might be foreseen that there is still a great deal of mineral reserves well beyond the anticipated levels at underground depths within the Earth's crust.

The mineral depletion has been assessed in association with sustainability also by Auty & Mikesell (1998), extensively. These authors and the supporters of mineral exhaustion theory discuss that mineral deposits are finite and therefore sustainability policies should be constrained so that mineral exploration and production should be limited in order to give the prospective generations an opportunity for sufficient resources. This might solely look possible by slowing down the mineral production domestically and by delaying and decreasing the export capacity for mineral selling countries.

However, Crowson (1998) states that if a mine is considered from an aspect of resource exhaustion only, then no operation is sustainable. Unlike the general accepted opinion for mine operators, many companies have joined other industries in order to contribute to sustainable development by strengthening the relationship between industry, environment and the society. In the recent years, big mining firms even happen to volunteer for policy-making in sustainable development more than identified in the literature and try to minimize the environmental impacts of mining by taking extra measures and improving social and economic liaisons with the stake holders. Therefore, sustainable development should not be perceived as the lifetime of mineral resources or a prolonged mineral wealth for a country. Practically, it is best to eliminate the environmental impacts of mining and ensure that the community is potentially kept satisfactory by additional social incidents.

3. SUSTAINABLE AGENDA FOR MINES

In order to make contributions to sustainable development, all mining operations must in the first hand be devoted to environment issue (Hilson, 2000). These operations should include resource control, monitoring and consumption rate, which are, classified under environmental management

techniques that apply to sustainable development. Within the framework of environmental management techniques, necessary changes are obliged to be made starting from the extraction until processing and beneficiation phases. Potential damages of a mine can be listed as dust problem, visual contamination, water pollution through heavy metal contamination and acid mine drainage, soil erosion, landform changes, vegetative demolition and noxious gases and sustainable development emphasizes that these problems need to be immediately solved before they turn into environmental crises at large scale.

Nevertheless, sustainable development means much more than simply complying with environmental standards. Principle 1 of The Rio Declaration says, "human beings are at the center of concerns for sustainable development" (Epps, 1997). Therefore, another essential element of sustainable development is accepted as the social responsibility, which has to take into consideration the needs of stakeholders. Mining companies are in touch with more stakeholder groups when compared to other industries. Positive relations have to be established with fund supplying foundations like banks and financial organizations and also social efforts have to be spent to set good liaisons with the residents in which the mine site is located. This close relation is usually a tough task for the investors because the community realizes the damages of mining as destructive and even irreversible. The persuasion of the society that the environmental damage is temporal and by providing donations for local organizations and even employment benefits, make the community to accept the mining activities more comfortably and with less complaints. This warm mutual relation is bound to lead to sustainable development naturally and undoubtedly.

The priority of mining companies like most trading firms is the maximization of profits and showing strong competition among other rivals in the national and international markets. In addition to such goals, increased environment awareness and socioeconomic correspondence also supply an amount of economic return, although in the long run. For instance, involving the local society in a range of mining activities return to the company in the form of easier exploration and production attempts at the other sites nearby. It is a fact that commitment to sustainable development in the mining context should satisfy all parties and the companies that choose to follow the sustainable development guidelines are likely to reduce the probable environmental impacts and enhance their relations with the stakeholder groups and the community.

4. CONCLUSIONS AND RECOMMENDATIONS

Mining sector and indirectly the minerals are very essential for the growth and progress of the countries due to their wide range of utilization possibilities as raw materials. With the increasing environment consciousness among public in the last two decades, sustainable development concept has been extensively pronounced in the mining context also.

Sustainable development, which is defined as the meeting of the current needs of the present generation without jeopardizing the resources of the future ones, implies that every activity in mining must serve environment conservation, social responsibility and economic benefits as in other sectors.

Environment protection is best accomplished by a proper and effective environment management policy. During exploration stages, necessary measures have to be taken to avoid any damage to the ecosystem (fauna and flora of the site) and to prevent pollution of surface, ground water and streams. During excavation, clear mining technologies that emit well-treated waste should be employed and for this aim, the equipment has to be modified or even substituted. During mine closure, reclamations study must be imperative so that the degraded land is restored and planned for after uses.

With respect to the socioeconomic agenda, mine operators should first try to collect information about the opinions of the community on mine development and calculate the way of life, relationships and social resilience within the community. They should identify the benefits and negative impacts to the society beforehand and determine the participation of local people within the mentioned mine project. Provided that a mine is economically investigated, a mine can provide employment benefits, local services and make financial donations to some charitable organizations in the community. Here, it can be concluded that in order to speak of a desired sustainable development in mining sector, environmental protection, social benefits and economic profits are always supposed to walk collaterally. Furthermore, it would be convenient to suggest the inclusion of a "sustainable development lecture" within the mining engineering curriculum at universities to raise more proficient young engineers.

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