It is a common perception that the mining and minerals industry is polluting and environmentally hostile. This impression is based on the past performance of mining when most mines were small businesses with a few miners trying to extract minerals with little understanding of future impacts. The nation was sparsely populated and generally the mines were located distant from population centers. Furthermore, the local communities had slight knowledge of the detrimental effects that resulted from abandoned mines. With expansion of the population, ease of travel, and greater concern for the environment, these adverse influences have been amplified. Additionally, mining in underdeveloped countries or areas with indigenous populations has generated issues about the equitable distribution of profits. The contemporary mining industry is abundantly cognizant of these concerns and is aggressively engaged in conducting operations in a safe and sustainable manner, and in restoring formerly degraded mining areas.

Issue
The minerals industry appreciates that whereas it mines and processes minerals to maintain and advance our standard of living, it must do so in a manner that protects the Earth and its environs so that the generations to come are not adversely impacted and can enjoy its bounties.

Background
Although awareness to the Earth’s environment had become a prominent topic earlier, the concept of Sustainable Development (SD) did not become widespread until 1987 when the World Commission on Environment and Development published Our Common Future, commonly known as the Brundtland Report. That report defined SD as “development which meets the needs of current generations without compromising the ability of future generations to meet their own needs”. This basic definition holds to this day though several attempts have been made to modify it to fit the minerals industry. One such effort was the Milos Statement resulting from the 14th Annual General Meeting of the Society of Mining Professors and the First International Conference on Sustainable Development Indicators in the Minerals Industry, both held in May 2003, on the Island of Milos, Greece. The Society for Mining, Metallurgy & Exploration Inc. (SME) was a participant in these meetings and adopted the Milos Statement, which addressed the entire minerals community and enunciated that:

- Minerals are essential to meeting the needs of the present while contributing to a sustainable future, and that the
- The minerals community will contribute to a sustainable future through the use of our scientific, technical, educational, and research skills in minerals, metals, and fuels.
The statement expounded that these goals would be achieved through professional responsibility, education, training and development, and communication.

Several conferences have been held (1992 to 2015) before and after the Milos meetings, with specific themes which corroborates the view that the mining industry has been making progress towards incorporating various attributes related to SD, and its commitment to SD goals:

- Establishing the “3 pillars” of Sustainable Development—economic, environmental and social.
- Publishing “Breaking New Ground: Mining, Minerals and Sustainable Development.” This document discussed the issue of SD and mining at length, and provided an agenda for immediate and future actions by the minerals industry.
- Developing a “Plan for Implementation,” comprising 10 chapters, and instituting criteria for measuring results.
- Accentuating sustainability indicators, data evaluation and reporting, life-cycle assessment, and product stewardship.
- Focusing on issues of benchmarking, SD value creation, operationalization of SD, creation of knowledge hubs, modeling, fiscal issues, and best practices and tools.
- Presenting frameworks and tools for integrating sustainable development considerations into mine and plant design.
- Attracting young professionals, since they are more amenable to accepting SD goals.
- Incorporating sustainability into the educational process, and development, monitoring and assessment of SD criteria for mineral operations.
- Integrating Economics, Community, Environment and Governance.

The above-listed themes underscore that the mining industry has been actively involved with SD almost from the beginning of the SD campaign and that many mining companies have cooperated, collaborated, and adopted new processes towards achieving its objectives.

It is clear the act of mining a finite resource is not a sustainable activity\(^2\). But it should be borne in mind that most of the communities where mining is conducted are sustained, in large part, by the mining operations. All industrial and many personal activities use mined minerals for a variety of applications and/or energy production. Thus mining has a significant positive impact on society in spite of its perceived detrimental consequences. Contemporary mining companies have incorporated SD into their long-term management strategies.

The development of new procedures and processes, use of new materials for manufacturing, greater emphasis on recycling, reclamation of old and current mining operations, cleaning up water discharges, improving air quality, and paying greater attention to health and safety, leaves future generations in an enhanced position and does not compromise their ability for a better life.

**Principles**

The major principles\(^3\) of SD are:

- Economic—which entails augmenting individual welfare; using all assets cost-effectively; incorporating environmental and social expenditures; and increasing the capabilities of business.
• Social—that is equitably allocating expenses and benefits to everyone; respecting human rights, including civil and political autonomy; cultural freedom; monetary independence; individual security; and to nurture improvements over a period so that future generations should not suffer from depletion of the resource.

• Environmental—so as to responsibly develop the resource with respect to the environment and remediate earlier impairment; diminish waste and destruction throughout the process; use caution when impacts are unidentified; work within environmental boundaries; and shield nature.

• Governance—assisting representative egalitarianism and participatory resolution of issues; support free enterprise with lucid laws and incentives; avoid concentration of power and institute checks and balances; have correct information readily available to all; be accountable for decisions based on careful scrutiny; promote teamwork to foster confidence; advance mutually accepted goals; and make decisions at proper levels and subsidiarity.

Stakeholders that have an interest in sustainability issues include employees, contractors, suppliers, customers, shareholders, creditors, insurers, local communities, local authorities, governments, NGOs (nongovernmental organizations), and others in specific instances. Particular stakeholders have special interests in certain issues. They assess if their interests are being met by tracking indicators or indices.

**Monitoring Indicators**

Indicators that may be used to observe whether the principles of SD are being observed include:

<table>
<thead>
<tr>
<th>Economic Contributions</th>
<th>Social Benefits &amp; Impacts</th>
<th>Environmental Protection</th>
<th>Governance</th>
</tr>
</thead>
<tbody>
<tr>
<td>performance of shares</td>
<td>lost time injury frequency</td>
<td>control harmful emissions from equipment</td>
<td>disclosure of contracts with extractive companies</td>
</tr>
<tr>
<td>net earnings</td>
<td>injuries requiring medical treatment</td>
<td>minimize deforestation for new mines</td>
<td>timely release of revenue &amp; operation info</td>
</tr>
<tr>
<td>percent return on capital investment</td>
<td>risk-related educational programs</td>
<td>control use of ozone creating gases &amp; sprays</td>
<td>make state-owned company accounts open</td>
</tr>
<tr>
<td>amount of mineral produced</td>
<td>regular medical surveillance of employees</td>
<td>use low sulfur diesel &amp; fuels</td>
<td>expose corruption</td>
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<tr>
<td>number of jobs created</td>
<td>lifestyle seminars and family assistance</td>
<td>treat emissions to minimize nitrogen oxides</td>
<td>encourage freedom of information</td>
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<tr>
<td>taxes and royalties created</td>
<td>ranking of company as desirable place to work</td>
<td>minimize use of benzene and volatiles</td>
<td>introducing comprehensive legislation</td>
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<tr>
<td>capital expenditures</td>
<td>employee perceptions about the company</td>
<td>reduce flaring of natural gas (DOI rules)</td>
<td>promote independent licensing</td>
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<td></td>
<td>percent employee turnover</td>
<td>minimize methane releases into the air</td>
<td>report revenues for easy interpretation</td>
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<td></td>
<td>workforce and training</td>
<td>eliminating spills of hazardous substances</td>
<td>balance with public sector</td>
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<td></td>
<td>wages</td>
<td>minimizing water used</td>
<td>reporting sources of revenue</td>
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<td></td>
<td>long-term incentive plan for employees</td>
<td>restrict disturbance of new lands</td>
<td>report all subsidies</td>
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<tr>
<td></td>
<td>number of local residents employed</td>
<td>reclamation disturbed land</td>
<td>open board selection</td>
</tr>
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<td></td>
<td>diversity of workers</td>
<td>managing waste creation</td>
<td>adopting international accounting standards</td>
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<tr>
<td></td>
<td>donations to charities</td>
<td>recycle products and waste</td>
<td>disclosing conflicts of interest</td>
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<td></td>
<td>work employee volunteers for community</td>
<td>reduce power usage</td>
<td>instituting proper auditing</td>
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<td>regulatory compliance</td>
<td>controlling corruption</td>
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<td></td>
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<td>countering the perception of corruption</td>
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</tbody>
</table>

**Adoption by Mining Companies**

Most mining companies have embraced the principles of SD, and the major companies publish annual reports on their SD activities. Several indicators have been developed to monitor the achievement of the various goals of SD, and these are being continually upgraded. Many financial institutions require plans for SD before financing new projects. They have also developed their own indicators which they use to monitor adherence to the plan.

The National Mining Association encourages SD and has adopted a position, the highlights of which are:

• Its members share a mutual responsibility with all Americans to ensure that their actions meet the needs of today without compromising the ability of future generations to satisfy their needs;
• The fundamental benefits of mining industry products to modern economic and social development and to environmental improvement are by their nature for the betterment of future generations as well as the current one;
• Economic benefits that mining provides to local communities encompass employment, wages, economic activity due to purchases of goods and services, and from the payment of taxes, royalties and fees to local, state and national governments;
• Members accept the importance of accounting for these factors and taking prudent steps to minimize them, balancing benefits with adverse impacts that mining may have;
• To recognize the responsibility to participate in and contribute to a decision-making process that allows balanced development.

SME Statement of Technical Position

• The National Environmental Policy Act of 1969 (NEPA) and the Surface Mining Control and Reclamation Act of 1977 (SMCRA) imposed considerable environmental restrictions on the mining industry; SME has always reinforced strict adherence to the laws.

• In 2002, SME established a Sustainable Development Committee to lead its efforts in this area and to propel the organization into global prominence.

• SME is a signatory to the Milos Statement of 2003 on Sustainable Development, so it is committed to providing scientific, technical, educational, and research skills in minerals, metals, and fuels.

• SME recognizes that SD programs adopted by the industry have a tangible return on investment through brand recognition and loyalty, facilitation of permitting, reduced occurrence of community protests and vandalism, and diminished political risks.

• SME actively promotes educational programs that encourage professional growth and interaction with the engineering professional community through books, articles, symposia, short courses and/or conferences on sustainable development in the mining and minerals industries.

• SME has developed abundant expertise to provide balanced advice to government bodies, congressional staff, and other interested organizations.

References


2SME, “Sustainable development; from environmental compliance to a shared value,” Mining Engineering, v 65, n 5, May 2013, p. 54–56.


