Sustainable development and the evolving agenda for environmental protection in the mining industry

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Abstract
To implement even the most widely accepted principles of environmental protection, appropriate governmental and industry structures are needed. Examples relevant to the mining industry are given. Despite improved performance, the mining industry needs to take further steps to fully embrace the concept of sustainable development. Most important is the commitment to "do the right thing", which has often been a motivating factor in the past.

Résumé
Pour mettre en œuvre les principes de protection de l'environnement, même ceux qui sont les plus largement admis, il faut des structures gouvernementales et industrielles appropriées. L'auteur cite des exemples dans le secteur de l'exploitation minière qui, malgré de meilleures performances, a encore des progrès à faire pour appliquer dans sa totalité le concept de développement durable. Le plus important est la volonté de « faire ce qu'il faut », qui a souvent été une force d'impulsion dans le passé.

Resumen
Para lograr la aplicación aun de los principios de protección ambiental más básicos y reconocidos, se requiere una infraestructura gubernamental e industrial adecuada. En este artículo se ofrecen ejemplos que conciernen a la industria minera. A pesar de los avances realizados, este sector industrial necesita de un esfuerzo adicional para alinearse con el concepto de desarrollo sostenible. Resulta fundamental adherirse al compromiso de acatar "las directrices correctas", compromiso que ya ha servido para marcar pautas de comportamiento en el pasado.

The mining industry has been a focus of criticism in the past. It has been associated with environmental impacts which are visible and intense, and too often the people most impacted by the mining have received too few tangible benefits. The recent development of new attitudes within the industry, encompassing environmental protection and sustainable development, means there is now room for optimism. Continually increasing commitment is being reinforced by technological advances. Of course major challenges still exist, but they are being met with more open-minded approaches and greater confidence. An example of one such challenge and the responses to it is given in **Box 1**.

Value systems: the basis of sustainable development

For everyone involved in the environmental debate, there have been milestone events which marked the evolution to sustainable development. Among the most significant are the first Environmental Protection Act in the United States,[1] the World Conservation Strategy of 1980,[2] and the Rio Earth Summit and Declaration of 1992.

Two important lessons can be drawn from these and other significant events. First, environmental protection and sustainable development are based on a system of values. While such values have common elements, they do not apply to every social, cultural and economic situation. It is often helpful, therefore, to formulate values appropriate to a particular situation in order to determine appropriate specific actions. Second, sustainable development requires action going beyond the requirements of regulatory control. There is more to be gained from partnerships between business and environmental interests than from confrontation.

A synthesis of the values which emerged from the World Conservation Strategy, and which were given more detailed expression by the UNCED Declaration of 1992, could read as follows: "The world should be good to live in, and to make a living in, for all of us, for our children, and for theirs."

Secondary principles for action can be derived from this primary value statement. The following four are widely accepted: some parts of the environment should be kept natural; animals and plants should be protected from extinction; productive capacity should be protected; and people should be able to live in a clean and healthy environment. These four principles are a prerequisite for sustainable development.

Since *putting these principles into effect* requires actions on the part of industry and governments, both must be equipped with the structures needed for implementation. The rest of this article examines some actions and structures relevant to mining. The examples given demonstrate the importance of a commitment to "do the right thing". Exactly what constitutes "the right thing" depends, of course, on what is appropriate to a particular form of development in a particular environment.

What governmental structures are suitable ?

There have been ongoing debates about the roles various parts of government should play in environmental protection. Much of the necessary expertise is found in mining agencies, whose primary function is the promotion of mining and minerals exploration. Environment agencies have the objectivity which comes from being more separate from industry, but they often lack resources to implement the policies they produce.

There are three possible structural models. In the first, all environmental activities are allocated to a central environment agency; in the second, all mining-related environmental activities are allocated to the mining agency; and in the third, which appears to be the most successful, there is a division of responsibilities. The third type is appropriate not only for environmental protection, but also for finance, occupational health and safety, etc. – in fact, for all those issues addressed by government which cut across others.

This model is based around a central agency (in this case dealing with environment) which oversees environment policy issues and provides external audits and advice on environmental activities. The agency is responsible for environmental policy, advice to government on yes-no issues such as major new development proposals, and, where applicable, environmental auditing. With regard to operations, specific environmental issues are addressed by the relevant resource agency(ies) – in this case, the mining agency.

What actions should governments take?

In the three-stage approach to environmental protection described below, industry is encouraged to go beyond regulatory standards and work towards sustainable development.

Stage 1: Prevent obvious problems
Previous investment and development decisions have left us with acute problems such as industrial air pollution, polluted waterways, and even the after-effects of catastrophes. Such problems affect the environment in a way perceived by reasonable people as unacceptable. Governments attempt to manage these problems by using their powers of intervention and regulation.

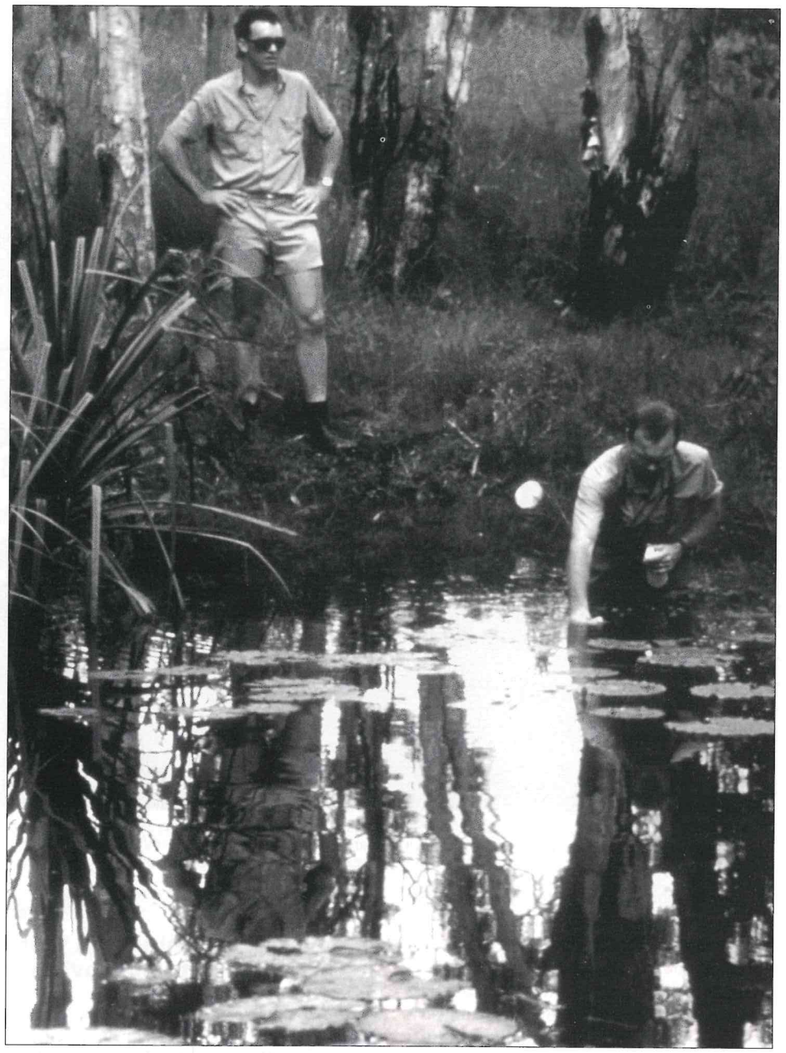
This first stage in the process concerns credibility and values as much as it does meeting scientifically defined limits. By preventing unacceptable environmental impacts, governments lend support to the greater part of industry which is not producing such impacts. One of the greatest difficulties encountered at this stage is that it is not always possible to improve environmental quality without curtailing productivity. This often requires governments to make hard decisions (for example, whether to apply coercive measures).

Stage 2: Adopt acceptable standards
Once acute problems are being managed, it is possible to move towards setting and enforcing standards for environmental performance in normal operations. The early part of this stage is characterized by command and control approaches, which are subsequently augmented by other instruments.

It is at this second stage that actions based on the four secondary principles mentioned above are formalized. Pollution prevention laws are directed at controlling emissions and/or establishing standards (e.g. for air or water quality). In some but not all cases, plans and policies are introduced to encourage wise use of natural resources. National parks and nature conservation areas ensure that some parts of the environment are kept natural. Laws are passed to protect rare or endangered animals and plants.

At this stage both coercion and encouragement may be used, depending on the circumstances. For example, some compulsion may be associated with overseeing the design and operation of tailings containment facilities. It is at this stage that proposals for expansion may result in industry being directed to rehabilitate old sites, or that reworking old tailings may be proposed as a better "walk-away" solution.

Stage 3: Encourage better performance
Once significant progress has been made at Stages 1 and 2, it is feasible to encourage industry to *go beyond* required standards. At Stage 3, governments should focus on working with industry rather than on command. Most industry is already aiming at continuous improvement. This can be expected to achieve more than coercive standards, since industry has the necessary technical and management capacity (and business incentive). Governments can provide encouragement through economic instruments, such as load-based licenses or differential taxes on environmentally sound products. They can also promote concepts such as cleaner production (see below), environmental management systems, or the use of mine improvement plans.



Jabiru, Northwest Territory: Collecting water samples downstream of the Ranger uranium mine. The regular collection of water samples must be overseen by a crocodile spotter. (ERA Ranger Mine)

The system will fail if the use of authority, which was appropriate at the previous stages, is extended to this partnership stage. It is not appropriate to use coercive approaches to require industry to do better than regulation requires, or to prescribe the means of achieving further improvements in performance.

How should the mining industry respond?

While some parts of the mining industry have been slow to respond to the challenge, the best performers are showing the way to sustainable development. Three examples of independent actions by industry are given in **Box 2**.

The most cost-effective protection is obtained when the environment is considered at the start of a project. It is somewhat surprising that, in the case of many mines, consideration, planning and management of mine rehabilitation, for example, still take place after the mine has already begun to operate. There are already too many mined-out sites in the world where insufficient planning, an unsatisfactory initial choice of equipment, and inadequate rehabilitation provisions have left a legacy of environmental costs.

The industry response with regard to new and existing mines is nevertheless improving. Alcoa of Australia has been one of the leaders, with its rehabilitation of open-cut bauxite mines in the forest areas of Western Australia. Before mining began, rehabilitation was planned for each 30-hectare pod. Mining equipment was chosen according to its suitability for use in rehabilitation work; mines were constructed so as to allow management of run-off water; mine floors were decompacted; topsoil and overburden were transferred from new pods to the previous ones for rehabilitation; and seed banks, nutrient reserves, seedling selection and plant disease were studied so that a juvenile

Lake Argyle area, Western Australia: Housing development for the commuter workforce servicing one of the world's largest diamond mines at Argyle. The fly in/fly out arrangement for the mine workforce reduces local environmental impact by avoiding the need to establish a full-scale urban community to service the mine. (Argyle Diamonds)

forest compatible with the surroundings could be planted. Today a number of other mining operations have had similar successes.

There is now a significant collection of "how to" literature, both national and international, on environmental protection in the mining industry. Among the most useful publications are UNEP's *Environmental Management of Mine Sites* training manual, the Australian Mineral and Energy Environment Foundation's *Environmental Management in the Australian Minerals and Energy Industries: Principles and Practices*, and the Australian Environmental Protection Agency's Best Practice in Environmental Management in Mining series. The latter is an expanding series that already includes more than ten booklets written by best industry practitioners in the Australian mining industry.

At mine sites, the most difficult environmental issue is perhaps tailings disposal. This has been much debated since the dam failures near Rustenburg and Virginia in South Africa, the incidents at Marcopper in the Philippines and Omai in Guyana, and the washout in heavy rainfall of the tailings dam at Ok Tedi in Papua New Guinea (see box entitled "Tailings management: the use of cyanide at large gold mines and other issues" on page 56).

What standard is possible for a modern mine?

A modern mine can be a very good performer from the environmental point of view. Examples are regularly found in the national award schemes now prevalent in mining countries. In Australia, the Henty Gold Mine in Tasmania is leaving a very gentle footprint on the earth. There is much backfilling with cemented tailings, visual intrusion is insignificant, cyanide in wastewaters is well below 1 ppm, and all mine process water is treated to drinking water standards with artificial wetland filters before discharge to streams.

Many mines now have effective waste reduction and waste (especially waste oil) re-use programmes. Programmes to reduce energy and water use and production of carbon dioxide are beginning to be initiated and are documented in companies' annual environmental reports.

Adequate information and experience are now available to allow operators to meet any reasonable expectation for mine site environmental performance. This is not to brush over the problems which may occur, but rather to indicate that the technology and management capacity exist to resolve most problems

While the mining industry can fairly claim to have made innovations which contribute to environmental protection, it needs to take further steps in order to fully embrace the concept of sustainable development. For this, it can look to guidance from other industries. A few examples are given below:

- There are increasingly comprehensive codes of practice, drawn up by both companies and industry associations. Many of these codes of practice have evolved beyond dealing with compliance issues and may include audits and public disclosure.
- The Responsible Care movement in Canada and the United States, which now exists worldwide, was created by the chemical industry. Its openness, and the involvement of the community and other stakeholders, are two particularly valuable features. (UNEP's APELL programme, which has been adopted in many countries, draws on experience worldwide with Responsible Care.[3]) Mining companies would benefit from adapting appropriate features of Responsible Care in their own codes of practice.
- The importance of cleaner production is well understood in secondary industry. It also offers great opportunities to the mining industry. Cleaner production is a sustainable development approach which places the emphasis on not producing waste or pollution in the first place, rather than cleaning it up afterwards. Through cleaner production, resources are used more efficiently and environmental benefits are often accompanied by health and safety benefits, cost reduction, and improved product marketability. Cleaner production has also reduced waste and waste disposal, as well as water, energy and raw material inputs, and has provided a cost-effective approach to lowering air emissions, including greenhouse gases.
- Company environmental reporting is being taken up by mining companies, following the lead of secondary industry. Company environmental reports cover policy, practice and performance. They disclose internal targets, which usually go beyond compliance, and discuss shortfalls as well as achievements. If managed well, and especially if propaganda or "greenwash" is avoided, this type of report can be a powerful management tool. It can challenge and reinforce good performance, offer benchmarks across industry, and contribute to establishing trust within the community. This trust is a prerequisite for company-community interaction of sufficient quality to promote sustainable development. Environmental reports are already a component of formal environmental management systems such as ISO 14001.

Box 1
Uranium mining in a World Heritage area: a dual study approach to improving conditions in the community

Closely supervised uranium mining has been going on for 20 years at Jabiru, an enclave within the Kakadu World Heritage area in northern Australia. Granting approval for mining was concurrent with the decision that a conservation area would be set aside, and that management must be in sympathy with the needs of the indigenous population.

Although the mining company, ERA, has gained recognition for its environmental management, and the local community has received significant royalties, some of the Aboriginal people feel that, even after 20 years of activity, they are no better off as a result of the mining.

This is a pattern found around the world. Even when the environment has been well-protected from mining operations, challenging social issues may still need to be addressed. This is a challenge to the industry and to governments alike. If the benefits of modern development are to be shared equitably, a broader view must be taken of sustainable development. Sustainable development in the mining industry should provide tangible benefits and an ongoing sense of well-being for those who are most directly impacted.

The response from industry and from the government at Kakadu has been very promising. The Aboriginal community was given support in carrying out its own study reporting on relevant issues, and expressing its aspirations, via the Kakadu Region Social Impact Study. A parallel study and report by mining executives, government representatives, and service providers produced a community action plan to address Aboriginal issues and respond to Aboriginal aspirations.

It was recognized that there was a need to help the local community improve in the areas of education, housing, cultural advancement, alcohol abuse, and service provision. It was also observed that money coming into the region was, inadvertently, the cause of other money being withdrawn: government funds had been redirected to areas which had no mining and were therefore seen as being in greater need.

This study approach, involving dual, fully empowered committees, has great potential for tackling local or regional issues.

Box 2
Independent actions by industry: some examples

Gold mining rehabilitation – North Canada

The Meliadine West Gold exploration project is near Meliadine Lake, on Aboriginal lands owned by the Inuit of the Kivalliq Region in the Nunavut Territory. The lands are delicate dry and frozen tundra, underlain by permafrost. Any scars from even slight human disturbance may take tens of years to disappear.

Approximately 100 drill sites from previous exploration have been cleaned up and rehabilitated. There is a programme for enhanced rehabilitation of tundra around drill sites. Peat is incorporated into the sterile rock-cutting, and judicious addition of nutrients stimulates root growth of native rhizomatous species.

Winter drilling in ice-covered lakes is accompanied by special precautions to prevent (non-toxic) drill cuttings entering fish habitat under the ice. Centrifuge techniques are used to keep drilling fluids away from the environment. There is zero tolerance of garbage and litter.

Environmental management – the Netherlands

Westmin Talc is one of about 100 companies in the Netherlands to have achieved ISO 14001 certification. The process of setting up an environmental management system (EMS) has taken about six years. The steps were as follows:

- ISO 9002 system for quality management;
- environmental audit;
- environmental base level for EMS;
- setting up and implementation of EMS to BS 7750 (British Standard);
- adjustment of EMS to ISO 14001 standard.

All changes were planned with an eye to economics, and with quantifiable benefits which meet normal criteria for rate of return. The EMS has resulted in advantages in the areas of operational control and environmental awareness. The advantages include the following:

- 75 per cent reduction of drain water pollution;
- over 50 per cent reduction of household waste;
- no mineral waste to dump (previously 110 tonnes per year);
- 80 per cent reduction of dust emission;
- 4 dB(A) reduction in noise emissions;
- asbestos, PCBs, and ozone-depleting substances removed;
- lower energy consumption.

Community and industry action – Western Australia

Action by the community and industry is helping protect the wedge-tailed eagle. The 50-metre road trains used at the Mount Keith Nickel Operations in Western Australia travel along the Kalgoorlie-Meekatharra highway, in areas where kangaroos abound. There can be as many as 100 kangaroo road kills a month. Large wedge-tailed eagles feed on the dead animals. The birds are slow to take flight when traffic approaches, and several of them may also be killed in a month. Through a combined community-company project, kangaroo carcasses are removed at least 20 metres from the road, allowing the eagles to feed in peace and safety.

Conclusion

Society is better informed (and more concerned) than ever before about the unacceptable impacts of particular mines. Governments and mining companies alike, aware of this concern, have provided the impetus for better environmental performance. Though far short of being universally available, the technical and management skills needed to protect the environment from the unacceptable impacts of mining exist. Within the framework of effective regulatory and enforcement procedures, and augmented by the application of community relations skills learned from other industries, this expertise can be a foundation for competence in social as well as environmental management. Only when this foundation is in place will mining make its proper contribution to sustainable development.

Photographs courtesy of Australian Minerals and Energy Environment Foundation.

Notes

1. The NEPA (National Environmental Protection Act), the enabling legislation for EPA's formulation, was passed in 1969. It is often considered the first such act in the United States. In earlier public health and environmental protection laws, authority was given to various federal and state agencies.
2. "It is unclear who coined the term [sustainable development], but by 1980 it was enshrined in the title of a key document for the eighties – *World Conservation Strategy: Living Resource Conservation for Sustainable Development*, published by the International Union for Conservation of Nature and Natural Resources, the World Wildlife Fund, and the UN Environment Programme. That *Strategy's* definition has stood the test of time well: 'For development to be sustainable it must take account of social and ecological factors, as well as economic ones; of the living and non-living resource base; and of the long term as well as the short term advantages and disadvantages of alternative actions.'" Linda Starke, *Signs of Hope: Working Towards Our Common Future*, Oxford, 1990, p. 9.
3. See, for example, the previous issue of *Industry and Environment* (Vol. 20 N° 3), whose theme is "Industrial Accidents: Prevention and Preparedness," as well as the APELL Newsletter in this issue.