

UNITED NATIONS

**ENVIRONMENTAL GUIDELINES
FOR MINING OPERATIONS**

Compiled by

**United Nations Department of Economic
and Social Affairs (UNDESA)**

and

**United Nations Environment Programme
Industry and Environment (UNEP)**

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PREFACE

The United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in June 1992, adopted Agenda 21 as the programme for environmental management for the 21st century. Agenda 21 emphasised the need for environmental guidelines for natural resources development. Five years on, at the special session of the UN General Assembly to review and appraise the implementation of Agenda 21 held in New York (UN Earth Summit + 5), Member States reaffirmed their belief that the implementation of Agenda 21 in a comprehensive manner remains important.

In recent years, both the Natural Resources and Environment Management Branch (formerly Mineral Resources Branch of the United Nations Secretariat) and the United Nations Environment Programme (UNEP) have been requested by a number of countries to provide environmental guidance for the mineral sector. The first edition of *Environmental Guidelines for Mining Operations* was published in 1994, and served as a useful sequel to the 1991 Mining and Environment “Berlin Guidelines” (see *Appendix I*), an outcome of the Round Table Conference organised by the United Nations and the German Foundation for International Development.

Four years on from the publication of the first edition of the *Guidelines*, continuing changes have occurred within the mining sector, particularly in the evolution of legal, fiscal and regulatory policies, accompanying the trend to liberalisation and privatisation of the industry. Among other things, environmental conditions attached to credit and insurance have raised the profile of environmental planning and management. There have also been major advances in voluntary actions by industry, and the standardisation of environmental management systems.

Recent changes in the structure of the world mining industry include the emergence of larger integrated global mining companies, and the transition of other companies to more specialised mining firms (based on specific commodities or activities). These changes have implications for the regulation and management of mining and environment.

During this time, significant advances have been made in defining and promoting best environmental practice in the management of mining operations. These advances have often been stimulated by leading-edge companies who have chosen to work in partnership with regulators and local communities to maximise corporate, national and community benefits, while minimising the social and physical environmental impacts.

In the environmental policy arena, national and international treaties, conventions, agreements, standards, the increasing use of environmental management systems and voluntary codes and corporate trends have also changed the regulatory context of the mining sector. Accordingly, this second edition of the *Guidelines* updates the 1994 contents at a time of rapid change in virtually all aspects of this industry.

These Environmental Guidelines for Mining Operations address:

- regulatory frameworks;

- environmental impact assessment (EIAs);
- environmental management systems and programmes;
- environmental monitoring programmes;
- environmental auditing; and
- enforcement.

as applied to all aspects of mining operation, but in particular

- exploration;
- mine operation;
- mine site rehabilitation; and
- small scale mining.

The increasingly integrated and collaborative nature of environmental control programmes means that all stakeholders - environmental and mining ministries, companies, communities and public organisations - must understand the interlocking nature of the various individual instruments described in this document. There is also an important role for personnel working in infrastructure and utilities, local government, planning and financing ministries.

The material presented in these Guidelines consists of recent examples of environmental management practices and regulations from various mining countries around the world. The examples necessarily reflect the legal and administrative context in the country from which they are drawn. They should not be taken as blueprints to be simply copied elsewhere without adapting them to different national situations. Each country must decide itself how to construct and implement its own regulatory framework.

These Environmental Guidelines, therefore, provide a *guide* to sound environmental management for regulators, practitioners, managers, government officials, and mining companies. They are not a prescriptive manual, but should rather be amended and improved according to the specific needs of each country.

HOW TO USE THESE ENVIRONMENTAL GUIDELINES

These Guidelines were prepared with the initial objective of providing a guide for regulators in developing countries. They are also expected to be of assistance to mining industry personnel, communities and others interested in regulation of the mining industry.

They include the following sections and features:

- a flow chart detailing a model environmental regulation regime for mining and associated activities. The chart provides an overview of the environmental components of a model regulatory framework.
- a brief text describing the background to the regulatory and management context.
- a number of *appendices* which provide more detailed examples for each of the key components identified in the flow chart.
- a list of published documents addressing management of mining and environment issues produced by United Nations and other selected agencies. These documents provide more detailed supporting information on technical matters.

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1. INTRODUCTION

Mining can be a potential source of wealth in developing countries, a point emphasised in the 1990s by the adoption of new, or modified mining policies and legislation in more than 75 countries world-wide. These changes have, for the most part, been undertaken to promote foreign investment and the creation of a stable fiscal and regulatory climate attractive to the international mining community.

But in addition to generating wealth, mining can also be a major source of degradation to the physical and social environment unless it is properly managed. These guidelines are designed to assist regulators, particularly in developing countries, to encourage sustainable mining while at the same time protecting the environment. In this context, the concept of sustainability could have a number of definitions. It is taken here to imply that (a) the carrying capacity of the impacted environment is not exceeded (e.g. the capacity of the receiving environment to attenuate contaminants is not breached), (b) the operation does not reduce the capacity of the biosphere's environmental functions to support human economic activities, (c) the area of land functionally required to support a community is not increased and (d) the operation makes efficient use of materials and energy in order to reduce economic costs and environmental impacts - the principle of "more from less". Fundamental principles to which all stakeholders are encouraged to subscribe are given in the box overleaf.

Environmental impacts can arise during all phases of the mining process. The *impact matrix* in Table 1 summarises the major effects that may potentially occur. Information on the nature of impacts and their management is included in the documents supporting these guidelines (see the table of contents) and in the documents listed in the bibliography (*Appendix 14*).

Minimising the damage of mining operations depends on sound environmental practices in a framework of balanced environmental legislation. These guidelines and supporting documents highlight what can be done in terms of regulation, administrative control and mine management to achieve an acceptable level of environmental performance for each operation. Training programmes can help to ensure that both government officers and mine staff are familiar with key aspects of these procedures. These guidelines, the supporting documents and bibliography can be a basis for such programmes. If necessary, UN agencies can further assist countries to organise such training programmes.

Drawing on an enhanced knowledge base, and the consequent ability to integrate sound environmental management practices into the planning and design phase, best environmental management practice can be more easily achieved by a new partnership between mining companies or government than by either party alone.

However, "best practice" is not static. The process of continuous improvement will certainly allow individual operations to raise their performance over time; but environmental targets also move as the issues and technologies evolve further.

The flow chart in Table 2, which identifies individual procedures and where they fit into the overall regulatory framework, provides a backdrop to these guidelines. A brief explanation in the main text is presented to support the concepts. Detailed supporting information is included as appendices. A number of reference documents produced by the United Nations and other agencies also provide more detailed information.

Fundamental Principles for the Mining Sector

(taken from the Berlin Guidelines: see *Appendix 1* for further detail)

Governments, mining companies and the minerals industries should as a minimum:

1. Recognize environmental management as a high priority, notably during the licensing process and through the development and implementation of environmental management systems. These should include early and comprehensive environmental impact assessments, pollution control and other preventative and mitigative measures, monitoring and auditing activities, and emergency response procedures.
2. Establish environmental accountability in industry and government at the highest management and policy-making levels.
3. Encourage employed at all levels to recognise their responsibility for environmental management and ensure that adequate resources, staff, and requisite training is available to implement environmental plans.
4. Ensure the participation and dialogue with the affected community and other directly interested parties on the environmental aspects of all phases of mining activities.
5. Adopt best practices to minimise environmental degradation, notably in the absence of specific environmental regulations.
6. Adopt environmentally sound technologies in all phases of mining activities and increase the emphasis on the transfer of appropriate technologies which mitigate environmental impacts including those from small-scale mining operations.
7. Seek to provide additional funds and innovative financial arrangements to improve environmental performance of existing mining operations.
8. Adopt risk analysis and risk management in the development of regulation and in the design, operation, and decommissioning of mining activities, including the handling and disposal of hazardous mining and other wastes.
9. Reinforce the infrastructure, information systems service, training and skills in environmental management in relation to mining activities.
10. Avoid the use of such environmental regulations that act as unnecessary barriers to trade and investment.
11. Recognise the linkages between ecology, socio-cultural conditions and human health and safety, both within the workplace and the natural environment.
12. Evaluate and adopt, wherever appropriate, economic and administrative instruments such as tax incentive policies to encourage the reduction of pollutant emissions and the introduction of innovative technology.
13. Explore the feasibility of reciprocal agreements to reduce transboundary pollution.
14. Encourage long term mining investment by having clear environmental standards with stable and predictable environmental criteria and procedures.

2. GUIDELINES FOR THEMATIC AREAS

Many organisations, agencies and professions involved in the mining industry have already developed guidance documents for different activity areas. Each is aimed at a particular audience, performing a particular function. However it is increasingly necessary that the various instruments complement each other rather than duplicate one another or even conflict.

In order to apply such guidelines in a consistent manner it is also important for each stakeholder to understand the environmental roles of their counterparts in other sections of the industry. Thus the simultaneous development of regulatory and voluntary instruments needs a good degree of co-ordination if the final mechanisms are to work effectively. Some instruments can be used by several partners concurrently, albeit in different ways. For example, instruments such as Environmental Impact Assessment (EIA) are incorrectly believed to be a regulatory tool only. In fact EIA can, and should, be used also as a mining project optimisation tool to enable the company to take cost-effective prevention measures.

This section will briefly sketch out a fuller picture of how various "guidelines" and "codes" that are now available can be applied in a mining operation. Such an overview is especially important as many technical and management codes are now actually written into, or invoked by, environmental regulations. This section therefore covers:

- technical operations that are subject to guidelines or codes
- managerial functions that are being codified
- environmental control regulations
- financial mechanisms, especially for rehabilitation
- guidelines for small-scale (i.e. artisanal) mining

2.1 Technical Operations

As in most other engineering sectors, a large number of technical standards and codes have been developed over the years to ensure efficient and safe operation. These cover mine planning and design, rehabilitation, the design of equipment such as pressure vessels or pipes, operating procedures for transport and lifting equipment, safe handling of substances such as explosives, fuels and chemicals, amongst others.

Technical and operational codes are commonly produced by national professional associations or standards bodies, but some large companies have developed extensive internal procedures that are explained in guidance documents available to personnel. For ease and convenience, regulatory bodies have increasingly incorporated such codes - essentially descriptive, non-legal, advisory documents - into their regulatory requirements.

Technical codes and standards have often originated from health and safety programmes in the past. Increasingly however, environmental matters are also being compiled into guidelines or handbooks in order to provide structured advice on the technical aspects of mining operations.

Two recent examples are:

- Mine Rehabilitation Handbook, by the Australian Mining Industry Council, now the Minerals Council of Australia, 1990
- Monitoring Industrial Emissions and Wastes, by UNEP IE and UNIDO, 1996

A large number of matters can be subject to technical guidelines, but as their function is simply to inform on practical aspects of an operation, they will not be discussed further in this document. It is only necessary to recall their useful subsidiary role in the development of both regulatory and management guidelines.

2.2 Managerial Functions

The increasing trend towards a preventive "impact avoidance" approach by industry, and the need to address multiple environmental issues simultaneously, has required a more structured approach to environmental action by company managers and regulators than was common in the past. In addition, industry is now advocating the use of internal procedures, voluntary codes and negotiated agreements as an alternative to further "command and control" regulations.

The result has been a series of recent management guidelines, codes and standards to ensure that companies can follow a more flexible, though not a less environmentally responsible, approach in a uniform manner.

Management instruments are also important to regulators, and there has been a gradual trend to incorporate some management standards such as ISO 14001 into environmental regulation or into permitting.

For a general overview of environmental management responsibilities and objectives we can usefully examine some of the codes of practice or policies prepared by mining associations. These cover broad areas such as those shown in Table 3. Examples of some mining association environmental policies are given in *Appendix 2*.

Table 3: Policy and Management Components for Mining Companies

From the Australian Minerals Industry Code for Environmental Management, 1996

- sustainable development
- environmentally responsible culture
- community partnership
- risk management
- integrated environmental management
- performance targets
- continual improvement
- rehabilitation and decommissioning
- reporting

In recent years, there have been two major initiatives to standardise such an approach. The most visible recent step in codifying environmental management functions has been the adoption in 1996 by the International Standards Organisation of the 14000 series of standards on environmental management systems (EMS). The European EMAS scheme, similarly, is highly standardised to ensure reliable, compatible application by companies. *Appendix 3* shows the content of ISO 14001. A training manual on EMS has been produced by UNEP, ICC and FIDIC to enable industry and regulators to be better informed on how these standards function and how to implement them practically.

It should be noted that EMS do not by themselves set environmental targets and objectives. Rather, they guide the management process of a company to ensure that environmental programmes can be effectively carried out. Setting of policies, objectives and goals is one of the important functions carried out within such a management system.

The subsequent implementation of an operational environmental programme requires a number of environmental action "tools" (such as life-cycle assessment, auditing, technology assessment, etc.) that may themselves have been subject to national or international harmonisation. UNEP reviewed these tools in a special edition of *Industry and Environment* (Vol. 18, No. 2-3, 1995), and for convenience this is reproduced in *Appendix 4*.

Some environmental management tools relevant to mining companies are expected to follow in the ISO 14000 series of standards, especially environmental auditing, life-cycle analysis, and eco-labelling. These standards will however not be ready for some years. In the absence of formal standards, general guidance is given in advisory or training documents issued by industry or academic bodies. The guidance document on environmental auditing published by the International Chamber of Commerce (ICC) in 1991 is one example of this. UNEP has published a guidebook entitled "Life Cycle Assessment - What it is and how to do it".

Perhaps the best known of the environmental action tools, environment impact assessment (EIA), is further discussed in Section 4.2.

Environmental auditing is one of the most used, and most useful, of the action tools. In addition to management audits, a variety of other more specific environmental auditing procedures focussing on pollution sources, wastes, energy, contaminated land, and so on has come into common use in industry world-wide, and many professional bodies have issued guidance documents.

Further off, but nevertheless of upcoming interest, are newer tools such as environmental accounting and supply-chain management, and readers are encouraged to keep up-to-date with developments in this area.

A particular note should also be made of environmental reporting, as this practice is rapidly expanding among international companies. As yet there is no standard practice for corporate reporting, and the best guide for the moment is to refer to the international overviews prepared by UNEP and other organisations.

The future standardisation of reporting environmental procedures will depend on the development of a suitable set of agreed indicators. An informal group of environmental performance indicators can already be derived from the many reports published, however, the industry is not yet close to deriving a full set of "sustainable development" indicators that include social factors. A great deal of work and discussion is currently underway on this subject.

Table 4 lists a number of advisory documents on environmental management published by international bodies. Comparable publications often also exist at the national level, and enquiries should be made to national minerals associations, standards bodies, or professional organisations. It should be noted that, especially in the case of the environmental policies, the definition of "environment" goes beyond the physical environment to cover the various components of sustainable development, including community issues.

Table 4**(a) Some Environmental Management Standards and Guidance Documents****Management**

1. ISO 14001 Environmental Management Systems - Specification with guidance for use, 1996
2. Eco Management and Audit Scheme, European Union, 1993
3. Environmental Management Systems - a training resource kit, UNEP/ICC/FIDIC, 1997

Auditing

1. ISO 14010, 14011, 14012 - Guidelines for Environmental Auditing (in draft form)
2. Guide to Effective Environmental Auditing, ICC, 1991
3. Audit and Reduction Manual for Industrial Emissions and Wastes, UNEP/UNIDO, 1991

Assessment

1. Life Cycle Assessment - what it is and how to do it, UNEP IE, 1997
2. Environmental Impact Assessment - a training resource manual, UNEP, draft for testing 1996
3. Anticipating the Environmental Effects of Technology, a Primer and Workbook, UNEP IE, 1996
4. Chemical Safety - Information sources, UNEP, 1993
5. Guide Methodologique pour l'Identification et la Gestion des Terrains Pollués, ADEME/UNEP, ready 1999
6. Hazard Identification and Evaluation in a Local Community, UNEP IE, 1992

Reporting

1. Company Environmental Reporting, UNEP IE/SustainAbility, 1994
2. The 1997 Benchmark Survey, the 3rd international progress report on company environmental reporting, UNEP IE/SustainAbility, 1997

Risk Management

1. EC Directive on Accident Hazards (Seveso Directive), 1982 and 1996
2. APELL - Awareness and Preparedness for Emergencies at Local Level, UNEP, 1988

(b) Some Industry Policies and Codes

1. International Chamber of Commerce, Business Charter for Sustainable Development, 1991
2. International Council on Metals and the Environment, Environmental Charter, 1998
3. Minerals Council of Australia, Code for Environmental Management, 1996
4. Mining Association of Canada, Environmental Management Framework and Policy, 1995

2.3 Regulatory Framework

It is in the national government's interest to provide a proper environmental, legal and taxation framework for mining activities. From the regulator's perspective, a clear-cut and enforceable framework is essential to effectively control the activities of the industry. From the industry side, it is important to have a regulatory system that is stable, transparent and that is appropriate to national circumstances, priorities, infrastructure and skills available.

Appendix 5 lists the most important principles that should be contained in a regulatory framework. The Whitehorse Mining Initiative Accord in Canada was the product of consultations between the mining industry, government, unions, Aboriginal peoples and the environmental community, and is an example of how the stakeholders in mining in a country can arrive at a consensus on how to govern and manage the industry. *Appendix 6* contains the final report of the accord.

Table 1 earlier showed the wide variety of environmental issues which need, eventually, to be addressed by legislation somewhere if they are to be controlled. The different judicial systems in countries have resulted in a variety of ways of allocating the responsibilities for these issues among mining, environmental and other laws. No two countries have exactly the same framework, and only a general overview of the possibilities can be given here. Thus, while some regulatory models are shown in the appendices, individual countries will need to adapt these guidelines to their particular circumstances.

2.3.1 Environmental regulation

Because of the number of issues now considered to be “environmental” a wide range of specific laws and regulations may apply. All countries face the decision as to how much environmental legislation should be generic to all industries, and how much should be specific to the mining industry. The administrative arrangements for enforcement tend to be complex because the division of responsibilities between mining, environmental, health and water ministries (amongst others), and between national, provincial or state and local levels of government is seldom straightforward. There is unfortunately no ideal system, and each country needs to decide based on its own priorities and circumstances.

Mining Legislation

Mining laws aim to regulate the sector in a variety of ways, and some environmental requirements such as waste disposal, occupational safety, control of water contamination are sometimes incorporated into such laws. While mining laws are rarely specific enough to allow for broad environmental programmes, this approach is nevertheless a useful first step to environmental control in countries where the appropriate controls do not yet exist elsewhere, or where they are very specific to mining operations.

Some environmental matters that mining laws may incorporate into specific schedules or regulations include:

- safety of structures and operations; limiting exposure to chemicals; explosive hazards;
- establishment of wastewater retention and treatment techniques, safe management of contaminated runoff, and groundwater contamination;
- soil erosion control and revegetation procedures during the operation as well as afterwards;
- requirements to prepare plans for mine waste disposal;
- reclamation and restoration of sites and disturbed areas, and removal of all unused structures and machinery.

Appendix 7 illustrates how mining is regulated from an environmental perspective in Western Australia.

Environmental Legislation

Environmental laws are used to address a wider range of ecological, conservation, pollution and health issues and have a much wider application than just mining. Owing to the range of issues, these may be dealt with by separate laws, perhaps even administered by different agencies such as pollution, conservation and national parks bodies. Among the matters that may be covered by specific environmental legislation are:

- environment impact assessment (EIA), or other environmental planning. Regulations may require that a formal assessment report be prepared for approval, but may also involve some form of project permit;
- nature conservation, protection of national parks, flora and fauna, endangered species and special scientific sites as well as cultural heritage and landscape features;
- water pollution laws to limit discharges into waterways of mine drainage, of wastewater and also polluted runoff;
- "clean air" laws to regulate air emissions, toxic gases or dusts from mining and refining operations; and
- soil contamination by wastes and chemicals.

Other issues such as noise, waste disposal and chemicals control are also sometimes regulated by environmental laws where they do not appear under health or other legislation.

Where the same issues are also covered by mining laws, the environmental regulation usually takes precedence.

Environmental Quality Standards and Criteria

Environmental standards, criteria and norms are found in regulations subordinate to environmental legislation. Criteria are scientifically determined "no-effect" levels of a pollutant, perhaps with a certain safety factor added. Standards are a regulatory requirement that provide the numerical limits to which industrial operations must be designed and managed. They can include:

- ambient water quality in streams, or effluent discharge standards;
- air emissions, and/or workplace air quality;
- noise emissions, or exposure;
- waste disposal, especially waste materials allowed to be dumped; and
- human exposure to dust, toxic chemicals or radioactivity.

There are no international environmental standards which apply around the world; each country has its own needs and circumstances and must set its own standards accordingly. Indeed, in many cases it is necessary or desirable to have standards specific to a particular site. The exception is where international norms have been recommended for human health e.g. drinking water. These are often copied into national laws.

In the past, industrial effluent discharge standards have often been set on the basis of what is technically achievable in a plant. This depends on available treatment technology, and may be more, or less, than the assimilative capacity of the local environment. While this may seem to be a practical approach for the engineer, it does not pay any particular regard to the needs of the environment. Where possible, the specifying of environmental quality goals is a more satisfactory approach.

Because environmental legislation is usually not sector-specific, the provisions may appear at first sight not to be well adapted to mining operations. It is here that flexibility in implementation may be needed to ensure that both environmental and industrial objectives are adequately achieved.

Other Legislation

Where environmental legislation does not cover the issues above, they may sometimes be found instead in other Acts such as health, welfare, safety, agriculture, transport, public land management and industry. As a rule the principal other laws which may apply are:

- health regulations (both public and workplace health);
- occupational health and safety;
- chemical laws, which cover the labelling and use of certain chemicals, or may prohibit the use of specified biocides, solvents and oils. Transport and storage of chemicals may be specified under “dangerous goods” legislation;
- waste disposal, especially of chemical residues, may require special permits.

International Conventions

Recent years have seen the number of environmental conventions increase significantly. They deal with an ever wider range of issues on which global action has been deemed necessary. Conventions now cover not only issues of biodiversity, world heritage and biosphere reserves, migratory species and wetland conservation, but also pollution and waste issues such as hazardous chemicals and wastes, and release of greenhouse gases (GHG) and ozone depleting substances (ODS). These conventions are notable for the use of trade restrictions as well as outright bans on certain substances.

Conventions bind in the first instances the governments that have signed them. The conventions oblige governments to pass national regulations to implement their commitment, often within specified time periods. These regulations are aimed at controlling local activities, and may be stand-alone or part of existing national environmental or waste laws.

2.3.2 Instruments for implementation

The nature of the relationship between the regulator and the operator can vary significantly, from confrontational through to collaborative. Where a regulatory body exerts greater control, it also accepts a greater level of responsibility, reducing the accountability of the operator. This may inhibit continuous improvement on the part of the operator, thereby undermining one of the principles behind sustainable development. In order to provide greater flexibility, the concept of co-regulation by the industry and regulatory agencies together is increasingly being tried in some countries.

In the past, governments tended to use command-and-control systems that gave little choice to industry. However, command-and-control can be costly to implement, will require an appropriately trained enforcement team, extensive and regular monitoring of operations, analytical and data evaluation support and an effective judicial system to administer fines etc. Government authorities are now using a variety of other regulatory approaches to overcome these limitations. However, none of these alternatives used alone is able to address all situations. In practice a mixture of regulatory instruments is now advocated - including some command-and-control - in order to provide the most suitable response to national needs.

Among the alternatives are:

- effluent and emission standards
- ambient quality standards
- performance targets
- economic instruments
- negotiated or voluntary agreements
- environmental management systems

Command-and-control systems are based on a general application of discharge standards and/or mandated technology designs, often irrespective of the industrial process being controlled. They are typically "media"-specific and were originally designed to reduce the discharge of specific pollutants to the atmosphere, land or water. Command-and-control can be highly successful in reducing pollution from certain industries. For example, it can be the most cost-effective and efficient approach to regulating many manufacturing processes where local factors have little effect on the production process.

In the mining sector, there are both advantages and disadvantages in the use of such an approach. Large mining operations lack the degree of standardisation present in other sectors such as manufacturing. Therefore, the standardised requirements which are an integral part of command-and-control may exhibit reduced efficiency, resulting in under-protection at some sites and unnecessary over-protection at others.

The use of fixed design standards under command-and-control regulations also stifles innovation by promoting standardised technological solutions that do not necessarily deliver the optimum environmental or economic performance at a given site. It is also incorrect to assume that because a specific technology is in place, compliance will automatically follow: human resource management, training and other factors will significantly affect whether or not the technology is correctly used. Finally, the use of design standards also does not promote a shift in corporate culture to "beyond compliance".

Ambient quality standards define the maximum legally allowed deterioration in air, water or soil quality that site operators must respect. Because such ambient objectives are based on the characteristics of local environmental conditions, a great deal of baseline study work is required before standards can be set. This is an efficient and equitable approach where only a single large industrial operation exists, but becomes complicated in the control of multiple smaller sources. Implementation and enforcement is more complex than for the control of discharge standards. Only a few countries have been able to translate this approach into effective legislation.

Environmental performance targets, similarly, are non-prescriptive in terms of what is considered the most appropriate technology. The choice is left to the operator, who is assumed to have sufficient expertise to make sound, well-informed decisions. Performance targets are also seen as locally responsive as they can take into consideration site-specific conditions (e.g. the local assimilative capacity of the environment, background concentrations of contaminants in soils etc). Performance targets differ from quality objectives in that they try to define the behaviour of industrial operations e.g. emission, levels, an incremental improvement rate, waste recovery rates or similar. The use of bans on certain activities, e.g. dumping of some wastes on-site, use of waste oil for dust suppression, or use of some hazardous chemicals, is included in this group.

Such an approach again assumes that there is an effective regulatory and enforcement system in place and that legal recourse in cases of non-compliance is feasible. Where sufficient resources are not available, independent monitors, trusted both by the government and the operator (and preferably the community as well), should be employed to monitor compliance.

Economic instruments, combined with information and education, can be an appropriate environmental management approach for mining, where there is a mix of small (entrepreneurial) operators using simple pollution controls and large corporations using state-of-the-art technologies. Here it is both complicated and expensive to identify individual polluters and enforce environmental standards. Economic instruments require fewer individual permits, monitoring and enforcement personnel, and thus offer an alternative and additional way to encourage action. They may be "positive" or "negative", i.e. incentives to perform better, or taxes on undesired activities or outputs.

Economic instruments are generally based on levying fees or taxes on certain operations or products that have high environmental impact. For example the carbon dioxide tax imposed by the Norwegian government on offshore oil operations (admittedly not a true mining activity but a good comparison all the same) has encouraged greatly enhanced energy efficiency and major reductions in flaring of "off-gas". More commonly, effluent and emission fees are set to encourage companies to reduce their environmental releases.

Taxes, or tax relief, on certain processes such as emission control equipment or the use of recycled materials may also be used.

While financial incentives for environmental programmes can be considered as economic instruments, most governments have only limited options here. Rehabilitation bonds are a particularly important economic instrument that is further elaborated in Section 2.3.3.

Voluntary agreements, covenants, and other instruments sometimes described as self- or co-regulatory, are finding an increasingly important place in the regulatory system. The advantage of voluntary mechanisms is their high degree of flexibility, allowing individual

companies to find the most cost-effective solutions in each case. Their disadvantage is their inability to ensure that all companies comply (enforcement mechanisms are rarely built into voluntary mechanisms), and the fact that non-signatory parties are not bound by the agreements. Nevertheless, programmes such as the ARET and MEND programmes in Canada, and the Greenhouse Challenge programme in Australia, demonstrate that sector-wide voluntary programmes can produce impressive results in some areas.

Environmental management systems have been used in regulations only on a limited basis, but apparently with good results. Companies with accredited environmental management systems are given greater flexibility in how they manage their operations. (There is no change in environmental performance targets nor are other requirements relaxed). The emergence of internationally recognised management standards such as ISO 14001 has speeded up the use of this approach, which is particularly suited to large corporations with high levels of management expertise. Some countries are now making the issuing of an operating permit conditional on the company being accredited under ISO 14001 or EMAS.

2.3.3 Rehabilitation Bonds

Rehabilitation bonds are a particularly important instrument in the mining sector. Given the high cost of remedial action at many sites, governments often seek assurance that companies will be able to fully rehabilitate their properties at no expense to local, regional or central government. The setting of rehabilitation bonds serves the purpose of reducing the risk of failure of the lease holder to the government to meet management commitments. They are intended to ensure that a normal range of costs associated with reclamation and closure of mines will be paid for by the mine owner or operator, either directly or through some alternative mechanism which assures their financial responsibility. These mechanisms are typically not intended to ensure against catastrophic events. Financial assurance assumes that the costs of reclaiming and restoring mined land to subsequent uses, and protecting the public from safety threats such as open adits, shafts and subsidence, are ultimately the responsibility of the owner or operator of the mine.

Bonds have been used successfully in Queensland, Australia. The following quotation describes clearly how they work:

"The maximum amount of security will be required for operations where lease holders cannot demonstrate that they are able to meet their responsibilities in terms of environmental management. A lesser security will be accepted after demonstrated performance on the mine site in accordance with the (EIS proposal). [...] The amount of security to be lodged may be reviewed [...] by the lease holder submitting (an amendment to the EIS proposal). [...] A security deposit applicable to any part of a mining lease will be released once that part of the tenement has attained the rehabilitation status prescribed in the (EIS) and conditions of tenure. The rehabilitation status at the surrender of the whole or part of a lease area shall be verified by audit".

Different types of security are shown overleaf.

- Hard** - Irrevocable Letter of Credit - an agreement between the company and the bank whereby the bank will provide cash funds to the authorities if the company defaults.
- Performance Bond - a surety bond issued by an insurance company in which the insurer is responsible for all claims up to an agreed limit.
 - Trust Fund - a fund that operates in a similar fashion to a pension fund with regular contributions being invested by a fund manager.
 - Insurance Policy - a special form of performance bond.
 - Parent-Company Guarantee - the parent company guarantees to indemnify the government in the event of a company default.
- ↓
- Soft** - Pledging of Assets - the company assets are pledged to the government.

During the start-up of an operation, working capital may be limited, presenting problems in ensuring that "hard" security is available. A phased introduction of security may therefore be required (allowing the security to accrue during the mine's life). However, "soft" security should only be considered where the risk is low (e.g. reclamation costs are low, the mine is profitable with good cash flow characteristics etc). Contributions to security funds, and the interest they earn, may be tax-free, as is the case in South Africa.

In setting the level of financial assurance, the permitting process plays an important role for three reasons. First, the permit can be used to identify the required standards for reclamation and environmental performance at the mine. Second, the mine plan is used as the basis for calculating the amount of financial assurance, taking into account such factors as the level of pollution prevention in place, planning for closure and design for reclamation. The third reason is that the permit is often the only way to successfully enforce the environmental performance and reclamation standards. The mine permit should clearly and explicitly define the terms for release of financial assurance; this protects the operator from the risk of constantly shifting reclamation requirements and the regulator from the risk of being unable to access the bond when required.

More proactive approaches are also possible. For example, the United States Environmental Protection Agency is moving towards more closely integrating the environmental costs of mineral processing technologies into its mine permitting process.

2.4 Enforcement

While all instruments promoting behavioural change require some monitoring, those based on compulsion require an effective and regular enforcement mechanism if they are to work. Traditionally, an environmental or mining inspectorate has been charged with enforcement, however the resources needed for increasingly complex legal requirements are not always available. Accordingly, new approaches to enforcement are being tried out at the same time as training and institutional strengthening is being sought to support conventional functions.

A particularly significant question concerns where the responsibility now lies for enforcement of environmental regulation of mining. The environmental inspectorate is not necessarily expert in mining issues, while mining ministries do not always have a background in

environmental affairs and can suffer from a conflict of interest. Nevertheless, questions of resource allocation now increasingly seem to favour a division of function, with environmental departments responsible, in consultation with the mining department amongst others, for standard setting and policy, while mine inspectorates undertake site inspections and enforcement of these standards. This arrangement is also compatible with the 'cleaner production' approach, where mine inspectors can directly overview the production managers' primary role in pollution avoidance. However the environmental inspection function is not abandoned, and there remains an important monitoring role for environmental agencies to collect information and confirm that enforcement is consistent with overall policy and standards. Close liaison between the various responsible government departments is essential.

In countries with a federal structure, it is often common for environmental enforcement roles to be delegated to provincial and local governments, who are often more in touch with local situations.

Whatever arrangement is adopted, compliance with environmental standards and legislation can be ensured by mechanisms such as:

- a) imposing civil liability in the form of strict liability on mining operators;
- b) compulsory insurance or payment into an environmental guarantee fund to pay for damages and compensation;
- c) rehabilitation bonds (see above);
- d) incentive measures to maintain environmental standards in the absence of specific regulations. Increasingly, major operators implement the standards decreed by their parent company, home government and/or international standards.

These measures all require some degree of inspection and enforcement by the competent authorities, and fines or sanctions of sufficient importance to dissuade non-compliance.

There is relatively less experience with enforcement of the newer instruments such as taxes, voluntary agreements and the use of environmental management systems. Much depends on the monitoring and auditing arrangements in place, since these systems impose in the first instance an information system rather than a fixed standard that can be checked in the field.

It is clear however that the skills required by inspectorates under such regulatory regimes are quite different to the traditional field skills. On-line data transmission, regular monitoring of operational rather than environmental parameters, and strict incident reporting are among the new measures being applied.

The growth in the use of voluntary agreements is also putting pressure on industry associations to monitor and report on the activities of their members, a role with which many are unfamiliar. Sector-wide reporting can be expected to become more common in future to supplement the corporate environmental reports now being published by major companies.

Government agencies are also starting to use consulting services in enforcement. For example, in Western Australia, not only are project EIAs prepared by consultants, the evaluation of the assessment reports is now being handled by accredited assessors rather than by the government agencies directly (see *Appendix 7* for details). A key new role for the agencies is now checking the credentials of assessors!

All enforcement mechanisms necessarily rely on adequate monitoring and data collection concerning operations. This aspect is discussed in the next section.

2.5 Summary

Table 2 provides an outline of a regulatory framework that incorporates all of the features described above. (Key elements of the outline that warrant further detailed description are ascribed a number that equates to appendix numbers of this document.)

3. MONITORING AND AUDITING

A popular phrase of uncertain origin but based on long experience, is that “uninspected things inevitably deteriorate”. Both government and company managers need robust and ongoing monitoring and inspection concerning the codes and regulations they are trying to implement. This section briefly examines the two main parts of such follow-up.

3.1 Monitoring

A monitoring programme should be closely tied to the environmental conditions placed on the mining lease, as one of the functions of the monitoring programme is to ensure and demonstrate compliance with regulatory requirements. Environmental standards for emissions and discharges from a site and acceptable concentrations of contaminants in soil and water are included in *Appendix 8*, but monitoring should also include relevant process and operational parameters needed to ensure better oversight of the entire site. Maintaining an up-to-date chemicals inventory is an example of this.

The schedule for a monitoring programme should be set up so that it is simple to operate and will provide data that can be directly utilised by the company. The essence of a good monitoring programme is to keep it simple, and this is reflected in the programme design:

1. Identification of the scope of monitoring required, and listing of the sub-programmes corresponding to each environmental issue.
2. Definition of the objectives for each sub-programme.
3. Specification of how the data or information collected will be used in the decision-making process.
4. Definition of the spatial boundaries for the monitoring work, and selection of sites for direct measurement, observation or sampling.
5. Selection of the key indicators for direct measurement, observation or sampling.
6. Definition of how the data will be analysed and interpreted, and how it will be presented in the monitoring report.
7. Definition of the precision and accuracy required in the data.
8. Evaluation of the compatibility of any data collected with historical data and with contemporary related data.

Appendix 9 provides a guideline for an environmental monitoring programme.

Environmental monitoring programmes may initially appear an expensive item for mining operations to implement. However, in reality they are a sound financial investment particularly when critical environmental constraints are identified. Planning can then ensure that cost-effective mitigating measures are adopted, a clean, hazard-free operating environment is maintained and mine site rehabilitation is undertaken in a continuous, cost effective and satisfactory manner. As the mine closure phase draws near, adherence to a well executed, approved environmental management programme will reduce the cost of mine environmental and final rehabilitation measures required to ensure a safe, self-sustaining land form remains and that rehabilitation bonds are speedily released.

3.1.1 Monitoring and regulatory requirements

In many cases, monitoring results, and any actions triggered by these results, are summarised in an annual environmental report to the government authorities. This describes the current state of the environment on the mine site and details the environmental parameters monitored.

Regular reporting of monitoring results - especially any non-compliance or unusual incidents - is now increasingly a feature (or even a condition) of company management systems. The authorities are increasingly relying on this mechanism rather than frequent inspection by their own staff.

Where monitoring indicates that environmental parameters are exceeding statutory levels, for example pollution or sedimentation levels of rivers and streams, a planned response should be determined and set in place to effectively control any adverse effects. Each monitored parameter should be linked to a contingency plan to enable corrective action to be taken.

Major companies are now also preparing corporate environmental reports for release to their employees, shareholders and the general public. These reports give a summary of environmental performance and compliance. A number of recent UNEP reviews have analysed the structure and contents of such reports.

3.2 Auditing

As the size and complexity of mining operations increase, regulators are increasingly working through new mechanisms such as environmental management systems and negotiated agreements rather than detailed inspection of command and control mechanisms. Monitoring and checking that these new mechanisms are properly implemented has thus given the government an important "environmental auditing" role, as a complement to the internal management auditing being undertaken by companies themselves.

The internal and external auditing roles share many common functions, such as:

- ensuring that compliance with regulations and standards is part of the corporate environmental policy;
- observing if the company has set quantitative goals for emissions and discharges beyond compliance levels; checking that goals are achieved, and if not, working out the reasons;

- ensuring that the company's employees, organisational structure, system and resources enable it to implement the environmental management system or agreement;
- confirming that an effective internal programme of monitoring, reporting and auditing is in place.

There is a wide range of audits that may be undertaken. Definitions of "audit" vary widely, but a number of different types concerned with environmental performance may be distinguished:

1. Environmental management systems audit - for those companies with a formalised EMS in place. This type of audit can be conducted at three levels:
 - * First Party Audit by the company itself (i.e. an internal audit);
 - * Second Party Audit by one company on another (e.g. audit on a supplier by a customer);
 - * Third Party Audit by an independent organisation against an appropriate standard.
2. Compliance audits - to demonstrate compliance or otherwise with environmental legislation, regulation, licences, approvals and other documentation, including the corporate environmental policy, and commitment to industry codes, charters and principles that the company has signed.
3. Technical or process audits - to determine whether a particular process or operation is having a detrimental effect on the environment. These audits may focus on energy, waste, pollution or site aspects, for example.
4. Environmental liability audit - as a prerequisite to insurance that covers both sudden and accidental pollution as well as gradual pollution.
5. Environmental performance audit - to assess the environmental performance of ongoing activity.

Professional and business associations now produce a wide range of guidelines of how to undertake such audits effectively. The forthcoming ISO standard on auditing was referred to earlier.

It is also useful to periodically assess the actual impact of operations against the initial environmental impact statement (EIS) (see section 4.2) through a form of impact audit. This is made easier if the EIS is structured to include a table of "Whole of Mine Life Commitments", such as planned safeguards, environmental management criteria and site closure objectives. This table provides a focus for the ongoing environmental auditing programme that should improve reporting to the approving authority. This report may be made public upon request in the same way as the EIS.

4. ENVIRONMENTAL MANAGEMENT PROGRAMME

Section 2 covered the role of formal environmental management systems (EMS). The EMS facilitates the preparation of a logical and cost-effective programme of actions to address environmental problems. An environmental management programme (EMP) is a set of

activities that ensures that operations conform with the regulatory requirements and the overall performance objectives set by the company.

In addition to providing an overview of what an EMP is, this chapter covers environmental impact assessment (EIA) and its associated environmental impact statement (EIS), as well as two topics of particular concern in the field of mining and the environment, exploration and small-scale mining.

4.1 Overview of the Concept

The EMP should be based on the environmental data and operational information compiled for the EIS. If an EMP is to be established for an operating mine that does not require an EIS to be produced, then the EMP should be based on information generated from an environmental audit of the operation.

The EMP should commence with a documentation of all relevant information, plans, targets, policies, regulations, objectives and management systems relevant to the site (see also *Appendix 3(a)*). The responsible personnel, their authority and resources available, the management of environmental records, communication and feedback networks, and employee training programmes for environmental awareness should also be identified in the EMP documentation. Some of this information will already have been collected in order to develop an EMS (if one is in force).

The EMP should provide for a means of adjusting to changes in government and corporate environmental regulations and requirements. It should also include an audit plan which incorporates a regular mechanism for checking the level of compliance with regulatory conditions and the environmental performance of all components of the operation. These procedures need to be structured to enable identification of areas where environmental improvements can and should take place and incorporate a mechanism for initiating an action plan to effect such improvements.

The EMP, its targets and objectives, should also be in conformity with national environmental policies (See also *Appendix 2*).

For further details on establishing an Environmental Management Programme (EMP), see *Appendix 3*. The factors to consider in the preparation of an EMP for an exploration programme are included in *Appendix 10*. Environmental protection during exploration is a subject area covered in detail in Environment Australia's booklet "Onshore Minerals and Petroleum Exploration". It is one of the documents listed in the bibliography in *Appendix 13*.

4.2 Environmental Impact Assessment (EIA)

The EIA process is usually undertaken when development planning of the mining operation is sufficiently advanced to be able to make a proper evaluation of the projected impact of the development on the environment and the community (see *Appendix 11*). It considers how the development of mining activity will affect the local human population, local and regional wildlife populations, local land use and overall ecology. Changes to water regimes and land contours, the disposal of mine waste and tailings, together with other issues such as the transport of product to market, all have to be evaluated.

The EIA procedure involves conducting environmental baseline studies to allow identification of the possible positive and negative impacts to the environment resulting from a proposed project, including both the "natural" and "human" environments. These impacts are identified over both a short-term and long-term time-frame.

The environmental studies, together with a description of the proposed mining operation, form the basis of an environmental impact statement (EIS). The EIS may include information on options to reduce environmental disturbance by the implementation of project modifications (e.g. siting of processing facilities in an alternative location).

The EIS is a valuable document to the mine manager as it describes all environmental features at the site. It is a logical starting point in the process of optimising the environmental performance of the operation. The EIS should be kept on site, and be updated with further baseline data as this comes to hand. Where there is a regulatory requirement for an EIS, the document is also submitted to the appropriate authorities for approval. Depending on the country and the nature of the likely environmental impact, this may be at national (federal), provincial (state) or local level. Depending on local requirements, some or all of the EIS should be made available to the local community.

The contents of the EIS:

- identify any environmental constraints on a mining development in that particular location;
- provide the basis of a plan for environmental management and protection (the EMP);
- determine the key environmental parameters to be measured in the environmental auditing procedure during the operational life of the mine;
- provide input to site and operational approvals and permits;
- ensure that the decision maker(s) and the community are fully informed of the nature of the development, its impact on the environment and the nature of the mitigating measures proposed.

With relevant information available at the design stage, the EMP can be designed to ensure maximum cost-effectiveness (sometimes even resulting in enhanced profitability). In addition, mine management and government officials will have a sound basis for planning for the eventual mine closure, knowing the natural background environmental criteria the mine operation will be required to meet in order to ensure that a safe, stable and self-sustaining landform remains that can support other land uses over the long term.

The formal EIA process can be summarised as a logical sequence:

- a) Referral of the project to the government authority or authorities;
- b) Government decision on whether an assessment is required;
- c) Scoping of issues and community reaction;
- d) Preparation of the EIS by the company;

- e) Public review of the EIS;
- f) Company response to issues raised in the public review;
- g) Report and recommendations by the assessing authority;
- h) Environmental approval (or refusal) and setting of conditions;
- i) Monitoring and reporting;
- j) Continuing liaison with community and government agencies.

Not all environmental assessments necessarily take the route of formal EIA. For example environmental screening for purposes of financing approval - increasingly undertaken by lending institutions - may take a simpler route. Invariably however the same evaluation criteria are used, as evidenced by the requirements of the Norwegian government (see the box below).

Mining projects should be submitted to a more detailed assessment if they fulfil one or more of the criteria set out below, or if insufficient information is available to answer "no" with a reasonable degree of certainty.

Will the project:

- create substantial pollution problems, and a risk of polluting land outside the actual mining area?
- create substantial waste disposal problems?
- create a risk of accidents which may have serious consequences for the local population and the natural environment?
- affect areas which support animal and plant life worthy of conservation or areas with particularly vulnerable ecosystems?
- lead to major changes in the landscape?
- affect areas with historic remains or landscape elements which are of importance to the population?
- change the way of life of the local population in such a way that it leads to a considerably increased pressure on the natural resource base?
- lead to major conflicts with regard to existing land use and ownership?
- obstruct, or lead to substantial changes in, the local population's exploitation or use of natural resources other than those directly affected by the project?

From: "Environmental Aspects of Selected Non-ferrous Metals Ore Mining", UNEP IE/ILO, 1991. TR5

4.3 Exploration

Exploration involves the collection of geological, geophysical and geochemical data to determine the mineral potential of an area. Exploration in most cases is a temporary, minimal impact land-use activity, although it may leave visible traces, especially in dry areas, for many years.

Government should seek to develop broad scale land-use plans as early as possible so that potential miners can readily identify lands that should not be disturbed due to ecological,

aesthetic or other reasons. Any exploration conducted in such areas would not necessarily lead to subsequent mining (except perhaps by underground means).

A proper commitment to environmental responsibility by the explorer should include consideration of the rights of other land-users and protection of the natural environmental values of the locality. New technology has reduced the environmental impact of exploration, enabling large areas of land to be evaluated by remote sensing methods (particularly during the reconnaissance phase).

Good environmental management is an important part of any exploration programme. Like any other mining activity, it should be undertaken in accordance with an EMP where land disturbance occurs. This will normally apply only to advanced exploration, which is defined as meaning "the excavation of exploratory shafts, adits or declines, the digging of test pits and trenches, and the associated removal of material for bulk testing from an exploration or mining licence area, the installation of a portable pilot plant or other temporary facility for ore and rock testing purposes, or any other significant ground disturbance conducted to determine the existence of a commercially exploitable mineral deposit". However even preliminary ground surveys are now expected to respect ecological integrity and pay attention to waste disposal issues.

The factors to consider in the preparation of an EMP for an exploration programme are included in *Appendix 10*. The contents of an EMP should ensure compliance with environmental conditions on both the exploration licence/permit and any financing requirements.

A rehabilitation bond should be negotiated for advanced exploration areas as a condition of the exploration licence or permit to ensure all disturbed land is fully rehabilitated. Environmental conditions should be fully complied with before a mining lease is granted.

4.4 Artisanal (Small-Scale) Mining

A regulatory framework should be able to cater to independent and artisanal miners, as well as to commercial or industrial small, medium and large-scale mining operations. This is as important for local entrepreneurs as it is for potential foreign investors and joint venture partners. Independent small-scale miners must be able to understand the legal and operating implications of mining agreements, and local entrepreneurs should be aware of the terms of participation in mining operations. Foreign-based companies should be able to enter a country with all procedures and regulations clearly defined.

The regulation of artisanal mining is a very complex problem in many countries. It requires a co-ordinated approach, since it is an economic, social and cultural problem, as well as an environmental problem. It has caused widespread environmental damage, and is often associated with serious health effects for the miners themselves. Its attractiveness lies in its ability to generate wealth for people who have no other means of supporting themselves. Any solution must take into account the health and environmental impacts of poverty, the needs of artisanal miners and their extended families, the needs of future generations, the ability of the authorities to monitor and enforce regulations, and the requirements of the large mining companies that often compete with artisanal miners for minerals and access to land.

Environmental problems caused by artisanal mining include mercury contamination, removal of plants, destruction of forests and jungle, degradation of river banks, digging of holes and

trenches that endanger wildlife, and erosion. Health problems arise from poor sanitation, breathing of mercury fumes, lack of ventilation and dust control and contamination of water by faecal matter, silt, mercury and organic materials. Safety problems are reflected in a high incidence of mining accidents, often caused by unsafe equipment and lax safety procedures. Indirect health problems include malaria and AIDS.

In order to regulate artisanal mining effectively in a country with existing artisanal mining activities, it may be necessary to decriminalise certain activities and make a fresh start. The authorities need to be, and to be seen to be, neutral and concerned for the national good and the better interests of the miners. If the miners are not operating illegally, they can be advised on how to improve their practices. Furthermore, they will not have to resort to devious means of operating, which are likely to be potentially harmful to themselves and the environment. They will also be liable to be more open to regulatory and administrative control.

Governments also have a central role to play in the transfer of new technology and training of artisanal miners in acceptable environmental management practices, e.g. proper handling and reuse of mercury. This work should be co-ordinated with the assistance of the public and supported by national and international institutions.

A common problem is that the mined products are sold illegally. Ensuring that miners are paid at market-related values is another means of bringing them into the mainstream of the economy. Access to a refinery operated by the state or private owners or to a refinery belonging to a nearby large-scale mining company provides a useful service (which should be paid for) to the miners, is to the benefit of the environment and the miners' health, and helps to demonstrate the bona fides of the stakeholders concerned.

5. PARTICIPATION

The participation of the affected communities in the decision-making process is an essential precondition for a responsible environmental policy and for avoiding subsequent conflicts. Notwithstanding the possibility of granting more extensive rights, participation is primarily ensured by giving affected communities access to relevant information at all stages of mining activities.

The access to information should be realised in two steps: the mining operator's duty to disclose certain information to the competent authorities and the citizen's right to obtain environmental information in turn from the authorities, including information disclosed by the mining operators. However, companies are also beginning to provide environmental information directly to the public, for example through corporate environmental reports.

5.1 Model Provisions for the Right to Access Information

The model provisions in *Appendix 12* show how access to information could be enacted as a legal right of citizens and affected communities. These provisions should be core elements of such legislation and each country should adapt and amend them for its specific needs.

5.2 Emergency Response Preparedness

Recent accidents concerning tailings have also highlighted the need for public information on potential risk. This information is needed if the public emergency response bodies and the

community generally are to be adequately prepared for a possible spill of tailings or other accident.

Emergency response plans necessarily require that the potentially affected community understands what it must do in the case of an accident. Also, public anxiety about the impacts of an accident is greatly reduced if understanding of the real consequences has been built beforehand. Such understanding is impossible to achieve after an incident because learning ability is diminished by high anxiety levels, and a low level of trust at that time.

UNEP's APELL (Awareness and Preparedness for Emergencies at Local Level) programme has been designed to help companies, local government and the emergency services put a co-ordinated plan together to improve public preparedness in case of industrial accidents, including those that may arise at mine sites. The APELL programme involves all the affected partners and actors, it is not a unilateral plan on the part only of the company, or of the emergency services.

An outline of the APELL process is shown in *Appendix 13*.

APPENDICES

ANNOTATED LIST OF APPENDICES

1. MINING AND ENVIRONMENT GUIDELINES ADOPTED AT THE INTERNATIONAL ROUND-TABLE ON MINING AND THE ENVIRONMENT

The International Round-Table on Mining and the Environment was held in Berlin, Germany, in June 1991. The guidelines for mining and the environment were drafted there. They contain a set of recommended actions by the various stakeholders in mining and the environment. The first edition of Environmental Guidelines for Mining Operations was produced as a result of the Round-Table. Thus the “Berlin Guidelines” help to set the scene and context for the present guidelines.

2. ENVIRONMENTAL POLICIES FOR MINING INDUSTRY OPERATORS

- (a) The International Council on Metals and the Environment: Environmental Charter
- (b) The Mining Association of Canada: Environmental Policy
- (c) The Australian Minerals Industry Code for Environmental Management

The attached documents set out the environmental policies of one international and two national industry associations, i.e. associations that represent the interests of their mining company members. They demonstrate the policies of some of the world’s leading mining associations, and thus of their members. The nature of the topics covered by each organisation, as well as the depth of coverage and different emphases, should be noted in particular.

3. GUIDELINE FOR ESTABLISHING AN ENVIRONMENTAL MANAGEMENT SYSTEM

This appendix describes the ISO 14000 family of environmental management standards, and, drawing on ISO 14001, provides guidelines for setting up an environmental management system.

4. ENVIRONMENTAL MANAGEMENT TOOLS

A wide range of environmental management tools has been developed in recent years. This document describes the most important ones.

5. PRINCIPLES OF A REGULATORY SYSTEM

This page summarises the most important principles that should be reflected in any regulatory system.

6. THE WHITEHORSE MINING INITIATIVE LEADERSHIP COUNCIL ACCORD

The Whitehorse Mining Initiative was a remarkable consultation between all the various stakeholders in the mining industry in Canada. The appendix describes the process behind the accord and the principles and goals the signatories to the accord undertook to aim for.

7. GUIDELINES TO HELP YOU GET ENVIRONMENTAL APPROVAL FOR MINING PROJECTS IN WESTERN AUSTRALIA

The Western Australian environmental regulations for mining are particularly advanced in that they incorporate a significant degree of co-regulation, coupled with strong enforcement and based on the high degree of trust that has been built between the mining industry, the state government and the community.

8. ENVIRONMENTAL STANDARDS

- (a) Air Quality Standards: Discharges to Air
- (b) Tentative Netherlands Soil Quality Criteria
- (c) Tentative Netherlands Ground and Surface Water Quality Criteria
- (d) UK Environment Agency Environmental Quality Standards for Water
- (e) Tentative UK Trigger Concentrations for Selected Inorganic Contaminants

Various developed country air, soil and water standards are presented as reference information.

9. GENERAL GUIDELINE FOR AN ENVIRONMENTAL MONITORING PROGRAMME

This guideline summarises the essential characteristics of an environmental monitoring programme for a mine.

10. ENVIRONMENTAL MANAGEMENT PROGRAMME FOR EXPLORATION

The various components that need to be included in an environmental management programme for exploration are described here briefly.

11. ENVIRONMENTAL IMPACT ASSESSMENT

- (a) Parameters to be included in an EIS
The environmental data that should be collected in an EIS is described.
- (b) Diagram of the EIA Process
- (c) Suggested Table of Contents for an EIS for a Mining Project
- (d) *Aide-Mémoire* for the Preparation of Environmental Management Programme Reports for Prospecting and Mining
This government document from South Africa sets out the requirements for mines to submit Environmental Management Programme Reports before receiving authority to undertake operations.
- (e) New South Wales Environmental Management Plans and Guidelines for Annual Reporting for Coal Leases
This document sets out the equivalent regulations in New South Wales, Australia.
- (f) India's Environmental Impact Assessment Regulations
The regulations regarding EIA in India are given here.

12. MODEL PROVISIONS FOR THE RIGHT OF ACCESS TO INFORMATION

13. AWARENESS AND PREPAREDNESS FOR EMERGENCIES AT THE LOCAL LEVEL - UNEP'S APELL PROGRAMME

The APELL programme addresses the need to prepare for emergencies long before they happen by ensuring that the mining company, the local authorities and the community know what the hazards are, and whom to contact, should anything go wrong.

14. SUPPORTING REFERENCE DOCUMENTS AND ADDITIONAL BIBLIOGRAPHY