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TOWARDS A REGIONAL LEGAL FRAMEWORK FOR POLLUTION PREVENTION

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1 INTRODUCTION

1 The Environmental Impacts of Mining

The environmental impacts of mining can be highly adverse if the proper pollution prevention technology and regulatory framework are not in place and properly functioning For example groundwater and surface water supplies can be permanently or temporarily contaminated by improper use of chemicals in the ore extraction process or by uncontrolled runoff from poorly placed mining waste, creating a hazard for the local community, wildlife, and other biological resources Specific pollutants, such as acid mine drainage or introduced toxics, can have a particularly devastating and long-term negative impact on the environment, as exemplified by the use of mercury for gold mining in sensitive ecosystems such as the Amazon basin Strip and underground mining practices may destroy soils and vegetation, leading to erosion, loss of habitat and other negative environmental consequences Furthermore ore smelters can emit hazardous air pollutants that are especially harmful

The costs of not addressing environmental impacts up front in a mining project can be quite high Clean up costs for contaminated groundwater and soil alone for large operations may run into the millions of dollars In the United States, for example it is estimated that the cost for cleaning up the Summitville mine site could be as high as $120 million Other countries in the Americas face similar challenges as they begin to discover the pollution legacy of years of contamination

Pollution prevention should be a strategic management principle for the hardrock mining industry It offers the opportunity to avoid or minimize significant environmental impacts of hard-rock mining while also identifying and promoting economy and efficiency in the design and operation It enhances recovery of minerals while at the same time helping to minimize impacts on the surrounding environment and prevent the creation of long-term environmental hazards and risks

2 The Need for a Regional Approach

Mining is a growth sector in Latin America and is primarily export-oriented As free trade expands environmental sustainability of mining operations will become increasingly important In order to assure that trade in mineral products does not exact downward pressure on environmental protection in the hemisphere it will be essential for governments to have a common basis of understanding and evaluating mining operations

The current realities of economics and free trade in the region emphasize the critical and timely need for Inter-American collaboration on regulating the environmental impacts of mining Latin American countries are vigorously seeking to expand their mining operations in order attract foreign investment create local jobs, and increase exports Over the next ten years for example Peru estimates $8 billion dollars of investment in the sector Argentina expects to receive $1 billion of investment in mining over the next five years In 1997 alone, $1 billion was invested in the mining industry in Mexico with about 45 percent of the investment coming from abroad At the same time, U S and Canadian companies are looking to Latin American countries for opportunities to expand their operations and to transfer clean mining technology

The case for addressing the environmental issues connected with mining on a regional basis is compelling Many of the mining companies are operating as multinationals They may bring their experience to bear on their operations -- experience not shared by many of the national and local government authorities A regional approach to environmental regulation helps avoid the complexity of different standards in different regions as well as setting a common playing field

Several countries in the region have had the opportunity to explore different policy and technology options for promoting pollution prevention and protecting common ecosystems or natural resources, these countries can learn these lessons through regional dialogue The federal government and state governments in the United States, as well as provincial governments in Canada are experiencing pressure for decreasing domestic environmental regulation of mining to avoid creating competitive disadvantages for local mining industries vis-a-vis Latin American mining operations Further, many of the natural resources potentially threatened by mining have common characteristics or may be shared by countries in the region As the environmental laws of most countries – especially those regulating mining – are still in the formative stages now is the time to initiate regional policymaking initiatives in this area

C Developing a Framework for a Regional Approach

Since 1997, the Environmental Law Institute (ELI), with the support of the United States Agency for International Development (USAID), the Tinker Foundation and the John D and Catherine T MacArthur Foundation, has worked in partnership with a number of regional environmental law centers throughout the Americas to develop a regional framework for pollution prevention in the mining industry throughout the region ELI and its partners – *Fundacion Ambiente y Recursos Naturales* (FARN) in Argentina, *Centro Especializado de Derecho y*

Politica Ambiental (CEDPA) in Bolivia *Instituto Socioambiental* in Brazil the Canadian Institute for Environmental Law and Policy (CIELAP) in Canada the *Comite Nacional Pro Defensa de la Tierra y Flora* (CODEFF) in Chile, *Centro Mexicano de Derecho Ambiental* in Mexico and *Sociedad Peruana de Derecho Ambiental* (SPDA) in Peru – each developed a national case study of legal and policy approaches to sustainable mining in their respective countries These national case studies focus on the different policy approaches, including economic incentives used in these countries to promote the concept of pollution prevention as well as the development and transfer of 'state of the art" pollution prevention technology and services The national case studies also identify gaps or inadequate mechanisms in these regulatory frameworks

Based on the results of the natural case studies, ELI has developed a preliminary framework for a regional approach for promoting pollution prevention This framework first defines what pollution prevention means in the context of mining operations Next, the framework briefly identifies the legal approaches that can be used for pollution prevention Finally, the framework identifies for each of the three major phrases of mining (exploration, active mining operations, and closure), (i) the potential sources of pollution prevention, (ii) the opportunities for pollution prevention, and (iii) the specific legal, policy and management tools that can be used to address the relevant pollution problems Select examples of pollution prevention tools currently in place in the countries studied are included

II A PROPOSED REGIONAL FRAMEWORK

1 Defining Pollution Prevention

Pollution prevention in the mining context under the proposed framework would mean source reduction recycling, treatment, and secure disposal It would mean designing operations to avoid or minimize the use, generation, or mobilization of pollutants, recycling materials and substances that might otherwise be released into the environment, and treating and securely disposing of hazardous substances, pollutants, and materials that could degrade the environment In other words, taking all the steps necessary to avoid creating costly contamination while at the same time creating economies and efficiencies in the use of resources

The terms source reduction, recycling, treatment, and secure disposal would have the following meanings under the proposed framework

Source reduction reduces or eliminates the quantity or hazard of pollutants at the point of generation Source reduction includes strategies to predict the occurrence of acid-forming materials, arsenic and toxic metals likely to be mobilized by mining activities and design operations to avoid or minimize contact with these materials and/or assure their isolation Source reduction can also include such strategies as substitution of cleaner processes for more hazardous processes - such as prohibition of mercury processes

Recycling provides for the use or reuse of wastes as a substitute for a commercial product or material in an industrial process It can include strategies such as closed-loop processes for handling acids and cyanides, and maximizing the reclamation/reuse of tailings water

Treatment is any method, technique or process that changes the physical, chemical or biological characteristics of waste materials in a way that eliminates harmful characteristics recovers energy or useful materials in the waste materials, leave them capable of being reused or safely contained, or reduces their volume It can include such strategies as decontamination of tailings

Secure disposal is any method, technique or process that prevents residual wastes from posing a threat to the environment This includes use of designed disposal units to prevent sulfide materials from coming into contact with air and water and generating acid mine drainage It may include placement of tailings in engineered structures with appropriate management and diversion of water to prevent mobilization and migration of pollutants

1 Laws that Can Serve the Pollution Prevention Objective

Environmental laws, policies, and management techniques can help make pollution prevention a key component of sustainable mining operations A variety of legal approaches can require the identification and integration of pollution prevention into metallic mineral mining operations This section briefly identifies the role that each kind of legal instrument can play

Environmental impact assessment (EIA), if properly structured, can require the mining operation (or the approving governmental agency) to identify potential sources of pollution and ways to avoid or minimize them through alternative designs for the operation It can require the examination of cumulative impacts on the environment by projecting both direct and indirect impacts of the mining operations and the impacts of other existing and foreseeable projects (and environmental stressors) in the same vicinity It can require the evaluation of alternative methods of excavation, beneficiation of ore, and treatment and disposal of tailings It can be used to identify monitoring requirements and mitigation measures to be implemented during and after the mining process It can be used to identify closure requirements, post-closure care, and contingency plans It can also engage the public by allowing them to identify issues of significance to them that might otherwise not be studied and by affording an opportunity for affected persons or agencies or local governments to identify needs for additional data on points of particular concern, as well as to suggest alternative mining or disposal methods, timing of activities, or monitoring approaches All of these can help improve the quality of mining operations and increase the confidence of governments and local citizens that pollution prevention is integrated into the entire mining process from beginning to end

Planning, too, can serve to increase the efficacy of pollution prevention Often the preparation of plans is integrated with environmental impact assessment However whether it is or not preparation of exploration plans (where there is to be significant disturbance of land or water), mining plans, closure plans, and contingency plans, can help assure that operations do not produce unintended pollution, even if conditions change It is important to design an operation so that it can be safely closed If closure planning is postponed until the middle or end of the mineral extraction phase, it may be too late to use certain pollution-preventing approaches Moreover, given the volatility of markets for metallic minerals, such issues as treatment, disposal closure, and contingency planning cannot be left unaddressed until a time when revenues may be insufficient to allow them to be properly carried out Various legal regimes require different plans, and have different timing requirements for the preparation and submission of plans While these need not follow the same pattern, nevertheless planning for each phase of the mining operation is important if pollution prevention techniques for the mine are to be properly designed and implemented

Permits are used under some legal regimes to assure governments' ability to review proposed operations and to take enforcement action against operations that do not carry out their legal commitments In many countries, the permit and the EIA approval are the same thing In others, they are distinct (or a permit may even be required in some instances where an EIA is not) Many of the potentially pollution-preventing functions of permits have been discussed above under EIA and planning -- identification of alternatives, pollution control measures monitoring, mitigation But permits also present opportunities to address enforcement and evaluation of an operator's fitness to operate the proposed mine (viz does the operator have a bad record in the past, does the operator have sufficient financial resources to carry out the commitments identified in the plan, permit, or EIA?) In addition permit review and renewal processes may provide the public with an opportunity to submit comments and insist upon appropriate monitoring and satisfaction of operator commitments Permits often require the submission of financial assurance guarantees (performance bonds reclamation bonds, insurance, letters of credit, etc) to assure that the mine is closed and reclaimed in accordance with the permit conditions even if the financial condition of the mine or parent company is impaired

Concessions are legal agreements between governmental owners of mineral rights and the mining companies who want to extract them While the terms of concessions typically address financial issues such as royalty rates, lease rates, taxation, and similar economic concerns, they also may address planning and operating issues, as well as the provision of financial guarantees for the performance of environmental obligations

Regulatory standards – which may be incorporated into permits, incorporated into EIA or that may operate directly on operators independent of either – can prescribe the use of pollution prevention techniques Such standards may include limitations on the use or handling of toxic substances introduced to the mine site (such as cyanides, acids, flocculents oils) Standards may also address construction and maintenance of ore beneficiation units

(mills, heap leach pads and ponds etc) to prevent releases of introduced substances, and they may address the handling of ores and waste rocks to avoid or minimize the release of naturally occurring toxic substances (such as acid metals arsenic) Standards may impose requirements for treatment, disposal and management of tailings and for management of storm water and ground water Regulatory standards that require operators to justify the use of mining and beneficiation methods that may produce pollutants, and to minimize such uses and provide for clean production may help promote pollution prevention in the metallic mineral mining sector

Financial incentives may provide means to encourage mining operations to adopt pollution prevention techniques Such incentives may include preferential tax treatment for pollution prevention equipment, programs for rebates or credits against royalties for successful pollution prevention, and other approaches While such incentives do not take the place of other legal tools they may provide sufficient inducement to improve the functioning of these other tools in the protection of the environment and human health and safety

Monitoring and disclosure requirements can provide information that allows both mine operators and governments to adjust management practices as needed in order to prevent pollution In addition, the public accountability provided by such disclosure may help encourage the adoption of pollution-preventing methods of mining, beneficiation, and closure

Public information and participation typically interacts with the other legal tools discussed in this study Required disclosures by mining operations, and opportunities for members of the public (and local governments) to participate in evaluation of mining approaches can improve the responsiveness of mining operations to local environmental and social concerns

Environmental management systems, while not generally required by law can nevertheless serve to improve the efficiency of mining operations – and hence their avoidance of unnecessary and wasteful pollution In addition, such systems can give investors and purchasers of commodities confidence in the operations and thus benefit the company s operations Adoption of ISO 14000 standards in a number of countries may drive mining companies toward greater pollution prevention in their operations

Rules for remining of abandoned sites and/or privatization of existing government-owned mines may provide some opportunities to remedy problems of the past while providing new jobs and more modern, pollution-preventing techniques

Land-use restrictions can also serve to prevent pollution For example areas of particular ecological value and fragility may be designated "unsuitable" for mining or for certain mining methods Similarly, areas with high concentrations of sulfide ores may be designated off-limits to mining under most circumstances because of their high potential for the generation of acid mine drainage – with mining allowed only under the strictest, best-

capitalized technologically advanced methods and conditions

These represent complementary legal tools that can help to integrate pollution prevention into the mining of metallic minerals

III INTEGRATING LEGAL TOOLS INTO A POLLUTION PREVENTION STRATEGY

Mining operations have the potential to prevent pollution at three phases exploration active mining operations and closure The following discussion highlights how legal and policy tools can be integrated into a strategy for preventing pollution in each of these phases

1 Exploration

Potential sources of pollution

Exploration operations can result in the disturbance of the land surface and the creation of air or water pollution with naturally occurring materials as well as with materials introduced to the exploration site during drilling and related activities Drilling associated with exploration can lead to the contamination of groundwater, by creating new paths for the migration of contamination Excavations associated with exploration can produce acid drainage and mobilize metals, as well as produce sediment and erosion Finally, road building and clearing activities can directly cause pollution through sedimentation and erosion, but can also lead (in some remote forest areas) to secondary environmental impacts through induced development

Pollution prevention opportunities

Pollution prevention during the exploration phase requires substantial attention to limiting the extent of disturbance This may include minimizing the area disturbed to that needed for exploration, and taking particular care in likely acid-generating areas to limit exposure of acid-forming materials Plugging of wells and drill holes is important Plans for abandonment of roads and suitable reclamation and revegetation of drill sites and other disturbed areas are important as well to assure that introduced contaminants or naturally occurring pollutants are not permitted to migrate, as well as in order to prevent unwanted development or degradation of lands

Legal, policy, and management tools

During the exploration phase it is important to assure that disturbances are those needed to locate and characterize the ore body, while minimizing impacts on adjacent lands and waters Standards and planning can help assure that undue degradation does not occur as a result of exploration, and reclamation requirements can help prevent contamination of

ground water erosion of drill sites and roads and the formation of acid drainage Requirements for financial assurance, such as bonding can also help assure that exploration areas are not left to become pollution hazards Environmental management systems can help exploration operations assure that materials are properly handled and accounted for and that exploration is both efficient and environmentally sustainable Because exploration operations establish the basis for future mining activities it is important to assure that they are conducted in ways that facilitate future mining while not impairing areas that will not be mined or where mining may not occur for a significant length of time

2 Active Mining Operations

Potential sources of pollution

Mining operations can cause the production of acid drainage Such drainage can mobilize metals, making them water pollutants Mining can mobilize other naturally occurring toxic substances such as arsenic, which may become air or water pollutants Active mines also are subject to accidental releases of cyanides, acids, or other introduced materials used in the mining and beneficiation process Such releases may be due to process upsets, failure of equipment or to precipitation events not adequately contained or controlled by the engineered design of the systems Mines may expose wildlife (and particularly birds) to such substances even where releases from the mine site are prevented

Active mines can generate substantial volumes of tailings and waste rock, which mav produce air pollution and water pollution during the operation They also produce large volumes of waste materials These include mine tailings and spent ores that may be contaminated with cyanides, acids, or other introduced materials – leading to potential releases into the air surface water, or ground water

Pollution prevention opportunities

One of the keys to prevention of long-term water pollution is careful characterization of ore and waste rock characteristics to determine what to disturb and how to handle and dispose of the disturbed materials Early and thorough understanding of the materials present at the site can lead to avoidance of acid-forming or toxic material where feasible, and careful control of its disposal when it is disturbed

Pollution prevention also involves use of cleaner processes For example, it may lead to use of techniques that do not introduce cyanides, acids, or certain beneficiation reagents to the site and that avoid use of mercury - still a problem in some countries In addition better design of processes can lead to use of a reduced amount of cyanides, acids, in the beneficiation process – chiefly through use of closed loop processes designed to minimize quantities used and released to the environment These techniques make more efficient use of the materials and improve recovery of metals at the same time Operations can also be

designed to minimize the exposed area of process ponds or to use closed loop recovery systems with no exposed ponds, in order to reduce exposure of wildlife and the surrounding environment to substances such as cyanide used in leaching operations

Control of site drainage is critically important to minimize the contact of precipitation surface water, and ground water on the site with contaminants or acid-generating materials Acid drainage controls include designs of mining approaches that exclude water or air from contact with acid-generating materials, and control of the bacteria that promote acid generation as well as the use of on-site and imported neutralizing materials to reduce acid generation Mine operations should also use designs that separate clean drainage from contaminated drainage in order to reduce the volume of water for which control and treatment is required For example, pollution preventing designs separate storm water drainage from contact with materials in tailings impoundments Such systems also recycle water used in beneficiation processes and from tailings slurries

Pollution prevention during the mining phase also includes use of leak detection systems and monitoring of groundwater, water, and air In addition, mines should provide for spill collection systems and containment structures for potential spills of hazardous substances The mining plan should also include contingency planning, equipment, and training to enable operators to deal with foreseeable process upsets, leaks, and releases

Pollution preventing techniques include the control of dust using nontoxic materials and with attention to the fate of dust suppressants This may include recycling of water used as a dust suppressant

Pollution prevention techniques useful during the active mining phase may include contemporaneous reclamation, where feasible to reduce the "footprint' of the mine on the landscape and reduce exposure of disturbed area to the elements – thus reducing the potential for air pollution and water pollution In order to accomplish better reclamation, operators can segregate and stockpile topsoil early in the mining operation for later use

Legal, policy, and management tools

Virtually all of the legal, policy, and management tools discussed in this report are applicable to the mining phase, and each may play some role in assuring that mining activities are efficient, clean, and produce impacts of limited duration on the surrounding environment Important tools include environmental impact assessment, standards for the prediction of acid drainage and for characterization of wastes, environmental management systems to provide for the handling of toxic substances, financial incentives and financial assurances to assure complete reclamation, as well as planning for the operation, for closure and for post-closure These tools can improve the efficiency of mining by integrating environmental concerns into the operation at each stage, this results in savings over attempting to do environmental protection after the fact, and can also reduce costs Cost savings may be achieved through such measures as limiting the amount of material requiring special handling - due to early and

accurate characterization of overburden and waste materials with acid-generating or toxic potential and through measures such as segregation of topsoil for reuse in reclamation and revegetation, and through control and recycling of process waters and introduced substances Mining plans and systems that account for all materials and that minimize the need for double-handling of rock and other materials can integrate efficient recovery of metals with environmental protection

3 Closure

Potential sources of pollution

At closure, mines can generate substantial pollution from the exposure of materials in the pits and the waste rock and tailings disposal areas Acid drainage can occur after the conclusion of mining and can worsen over time Similarly, contaminants contained in the tailings and spent ore from the beneficiation process may be released into the water and groundwater after closure of tailings disposal areas and heaps

Impoundments remaining after mining may become contaminated with acid drainage, metals, and other pollutant posing a hazard to wildlife and (if impoundments are hydrologically connected to surface or ground water) to other water users and the environment

Dust particles from tailings and spent ore areas can cause air pollution after mining and closure has been completed, if they are not properly stabilized and/or covered

Pollution prevention opportunities

Pollution prevention techniques relevant to closure include isolation and containment of acid-producing materials Use of neutralizing and other materials to prevent acid mine drainage and metals transport in pits, impoundments, and other waters is important Topsoil and revegetation can help stabilize and control waste areas in their post-mining configuration to limit movement and water infiltration

Rinsing, decontamination, and covering of spent ores and tailings coupled with drainage controls to prevent migration of contaminants remaining in place after closure are important techniques These measures may also include dewatering of mine tails and/or hydrologic controls for tailings impoundments to ensure long term stability Such measures should generally be accompanied by monitoring and maintenance to assure hydrologic controls are working to control drainage and to prevent water from contacting and mobilizing contaminants of concern

Changes in the postmining configuration of the land can also reduce the threat of pollution Such approaches may include filling of pits where feasible in order to reduce the

potential for collection and contamination of pit water and to reduce the exposure of waste rock to oxygen and water where it may contribute to possible acid drainage Plugging wells and adits can help prevent water pollution and the discharge of metals-laden mine site waters to surface and ground water

Removal of introduced material including pollution control wastes beneficiation chemicals and reagents laboratory chemicals, oil, etc , is also an important part of preventing pollution after mine closure

Legal, policy, and management tools

Closure of mine waste units such as tailings impoundments and spent ore dumps is best accomplished if fully planned prior to the commencement of active mining Planning environmental impact assessments (to help consider alternative sites and methods for disposal areas) environmental management systems, and financial assurance can all improve post-mining performance Standards for closure, if incorporated into the project design, can provide a key benchmark by which to assess performance In addition, public information and transparency can improve the effectiveness of post-mining controls – assuring that disposal areas remain undisturbed after closure and do not create any risks to local populations

IV POLLUTION PREVENTION AND EXISTING NATIONAL LAWS

A preliminary review of the national case studies indicates that the countries studied are just beginning to incorporate pollution prevention into their laws regulating the environmental impacts of mining In general, countries have focused on pollution prevention more in the initial stages of mining (exploration and start-up) than in the course of actual operations and closure Moreover, the use of financial incentives and environmental management systems to promote pollution prevention in the mining sector appears to be very limited The following discussion highlights some of the areas of progress as well as gaps in national legislation promoting pollution prevention

IV Environmental Impact Assessment

The environmental impact assessment procedure is gaining great popularity in the region as a tool for preventing the environmental impacts of mining However, there still remains a need fine tune the use of this tool to actually promote pollution prevention For example, in Peru significant exploration activities are only required to present an 'Environmental Evaluation" rather than an "Environmental Impact Study " The Environmental Evaluation" differs from the "Environmental Impact Study' in the issues that must be addressed, the periods for approval and the requirement for conducting a public hearing As a result, opportunities for promoting pollution prevention may be lost In addition, even in the case of operations subject to preparation of an 'Environmental Impact Study," the focus is on controlling and mitigating environmental impacts rather than preventing them in the first place This is because the applicable environmental standards are

oriented towards control of contamination at the end of the process and compliance with maximum permissible limits It is interesting to note that in contrast to this situation Peru s environmental laws for the manufacturing and fishing sector now incorporate methods promoting pollution prevention

IV Standards

While several countries have general pollution control standards that could be interpreted to promote pollution prevention, only very limited progress in the region has been made towards establishing standards specifically promoting this objective Environmental standards tend to establish general limits on emissions or limits on environmental concentrations rather than promote specific pollution prevention practices such as source reduction or recycling Peru, for example, has maximum permissible limits for liquid effluents that regulate Ph, suspended solids lead, copper zinc, iron, arsenic and cyanide, as well as maximum permissible levels for certain air contaminants, including lead, arsenic and particulates In addition, Peru has suggested practices outlined in a number of environmental management guides on topics such as water in mining operations, acid mine drainage and tailings management Other than measurements for the prediction of acid mine drainage these guides do not promote any specific pollution prevention practices

Concerns over the adequacy of existing approaches have led to some unexpected results For example in 1998 the citizens of the State of Montana in the United States voted in a referendum enacting a law to prohibit the establishment of any **new** surface mining operations using cyanide Likewise, the State of Wisconsin adopted a moratorium on the mining of sulfide ores until companies could present evidence of successfully closed mines that did not generate acid The U S Bureau of Land Management has proposed regulations that would require operators to "minimize water pollution (source control) in preference to water treatment and to "handle earth materials and water in a manner that minimizes the formation of acidic toxic, or other deleterious pollutants of surface water systems" and manage excavations and other disturbances to "prevent or control the discharge of pollutants into surface waters" among other pollution prevention requirements including "minimiz[ing] the likelihood of acid formation and toxic and other deleterious leachate generation " Controversy surrounding each of these moves suggests that the process of setting and communicating standards with a pollution prevention objective in mind deserves more attention

IV Public Participation

National laws are beginning to incorporate mechanisms for public participation at a variety of stages of operations Peru for example, requires a public hearing in connection with the preparation of the environmental impact assessment for mining operations However the effectiveness of this mechanism may be limited because individuals are not guaranteed participation in the hearing, questions may only be posed in written format the hearings are only held in the central headquarters of the Ministry of Energy and Mines in Lima and the authorities are note required to consider the contributions made in the hearing Mexico has a established a procedure, "denuncia popular," that allows any person to file a complaint with the appropriate federal, state or municipal authority concerning environmental problems Canadian citizens, through mechanisms in some environmental legislation have the opportunity to request an investigation of an alleged offense and, if pollution prevention practices are substandard, also can file a petition through the newly constituted Commissioner of Environment and Sustainable Development with the responsible federal department

IV Financial Incentives and Environmental Management Systems

National laws have not focused significantly on financial incentives as a tool for promoting pollution prevention in the mining sector In part the problem may lie in more general policies, such as exist in Peru, precluding the use of financial incentives such as tax credits for this purpose

While some countries are begin to experience the voluntary use by the mining sector of environmental management systems such as ISO 14000, such tools have not formally been incorporated into the regulatory structure Mexico, for example, has a Voluntary Management Program in which the mining industry can participate The most significant voluntary environmental program in Canada, the Accelerated Reduction and Elimination of Toxics Program (ARET), includes as members 31 of the 34 members of the Mining Association of Canada However, due to a number of problems with the ARET program -- including, among others, allowing baselines to be set too early, the lack of third party verification of emissions reduction claims, and inconsistent monitoring and reporting methods -- as well as the combination of poor enforcement records in Canada and decreased department and/or ministry capacity for enforcement, the current voluntary programs may have serious consequences for Canada's environmental regulatory framework One problem in the U S and possibly other countries associated with the use of these environmental management systems is that potential liability under environmental laws may discourage some operators from disclosing operational problems and/or violations on a voluntary basis

5 CONCLUSION

Pollution prevention offers the mining industry the opportunity to address

environmental problems while at the same time taking advantage of economies and efficiencies in operations While national governments have begun to incorporate pollution prevention strategies in their laws and policies, considerable work remains to be done in this area to produce a comprehensive approach to pollution prevention in all phases of mining operation exploration, operations and closure The development of a regional framework for promoting pollution prevention would greatly assist governments in this task In addition it would assure that as trade and investment in mining operations in the hemisphere expands, governments are not confronted with downward pressure on environmental protection Mining companies would also benefit from a consistent approach in the regions towards regulation of their operations