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Research on Mine Closure Policy

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1. Introduction

Planning for mine closure must begin before approvals are given for the development of a mining project.[1] A Conceptual Mine Closure Plan[2] submitted at the feasibility stage must include plans for decommissioning and rehabilitation of each component of the mining area with cost estimates. An appropriate funding mechanism is essential to ensure sufficient funds are available for mine closure activities and that all decommissioning and rehabilitation requirements are complete. The plan must be reviewed periodically through out a mine life to cater for changes in the overall mining plan, environmental reviews and needs and aspirations of the communities. Consultation with all external stakeholders and their participation are vital for the successful closure of each mine and to ensure social and economic activities are maintained. The primary concerns for decommissioning and rehabilitation are to ensure public safety and health, environmentally stable conditions compatible with the surrounding environment are achieved and to minimize environmental impacts caused by mining. The overall objective is to have a social, economical and environmental sustainable development.[3]

The following are ideas-force that shape the ideological standing of this research:

- There is a pressing need all over the world to confront the issue of mine closure. The pollution legacy makes difficult the sustainability of the mining activity and it is imperative to set up comprehensive mine closure systems.
- Main political decisions have to be made and this requires the involvement of governments, mine companies, NGOs and the organized civil community.
- Policy issues, in its broadest meaning, are core to the understanding of the situation and thus, a research is needed beyond the technical aspects of mine closure. Specifically, a

[1] According to Mudder and Harvey (1999), "Proper planning for closure should come during the feasibility study, design and permitting phases of a mine, and be upgraded during operational life. This approach has become the standard or is a required practice today. The lack of a proper or updated mine closure plan can result in severe environmental and economic consequences. Inadequate closure activities, water management, and waste rock disposal plans have prompted unexpected and, in some instances, unwarranted secondary environmental impact statements or assessments."

[2] The issue of the objective of mine closure is beyond the scope of this report. See Nazeri (1999) and Mudder and Harvey (1999). According to Nazeri (1999), the objective of mine closure is to provide long-term stabilisation of the geochemical and geotechnical conditions of the disturbed mining areas to protect public health, and minimise and prevent any additional or on-going environmental degradation. Mine closure is, typically, required at a time when the operation is no longer economically viable, when cash flow is often severely restricted or negative, and when the value of assets is below the expenditures required to achieve the environmental objective of mine closure. The objective of securing mine closure funding at an early stage is to mitigate against the risk that an enterprise may either be unwilling or unable to undertake mine closure due to lack of funding. According to Mudder and Harvey (1999), the objectives for closure of a typical hard rock mine include minimising long-term environmental liability, attaining regulatory compliance and maintaining geotechnical stability, while closing as quickly and cost effectively as possible - in a manner that returns the land to a safe and stable configuration for post-mining uses. Some of the key features that must be considered during decommissioning and closure of a mine could include any underground workings, tailings impoundment, open pit, surface waste rock dumps and spent leach pads.

[3] Graeme Hancock and Ani Topurua, 2000.

research should include legal, institutional, economic, and public participation considerations.

- There is much to learn from each other and from countries with mature systems on mine closure.

2. General Public Policy

2.1 Mine Closure Legislation

In this chapter it will be presented a few examples of national or state legislation which addresses the issue of mine closure[4] and some reflections as to whether it seems to be advisable to have an independent (only purpose) mine closure law or rather, it works better to have mine closure norms in various legal bodies (i.e.: environmental law, mining law, and so forth).

Some countries and jurisdictions (especially in North America and Australia) have established detailed mine closure requirements and procedures. But for most countries there are presently little or no applicable laws, regulations, standards and norms.[5]

It seems that it works better to have an independent mine closure law that establishes a single agency to implement the law. This model gives the business community an assurance that one agency will take the lead on its problems and that it will not have to answer to many differing opinions on how operation, reclamation and closure success will be measured. This model also allows the public and NGOs a single place to go for information on mining regulation.

Even as the mining acts of Latin American countries typically contain specific references to the recovery of degraded areas, it is in the complementary regulations that the more general tools for environmental management and evaluation are found. Alternative legal frameworks for managing mine reclamation are found in Argentina, Ecuador and Peru. In Mexico, the regulation for system evaluation and environmental management is contained in the regulations governing mine development.[6]

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[4] The concept of mine closure is an issue by itself. However, it is not within the scope of this report. For a complete analysis of the concept of mine closure see Mudder, Terry and Kevin Harvey. Closure Concepts. Mineral Resources forum, UNEP, 1999. "There are many different words used to describe closure including decommissioning, reclamation, rehabilitation, and post-closure. In this paper, decommissioning is referred to as the transitional period between cessation of operations and final closure. Reclamation refers to the physical aspects of earth moving, regrading and revegetation. Rehabilitation is another word for closure used primarily in countries other than the United States. Closure is a term reserved for the point in time at which revegetation has been completed, excess solutions have been eliminated to the extent practical, the maximum degree of passive management has been implemented, and a final surface and/or ground water monitoring programme has been initiated." Mudder, Terry and Kevin Harvey, 1999.

[5] Strongman 2000.

[6] Veiga et. Al. 2000.

2.1.1 Australia

In the case of Australia, mining development is administered by the States and Territories, but the Commonwealth (federal) Government's Environment Protection and Biodiversity Conservation Act 1999, which came into effect in July 2000, has established a nationally consistent framework for environmental assessment of new projects and variations to existing projects, based on consultative agreements between the two levels of government.[7] Mine closure issues are an important consideration in the assessment process for mining proposals. All States and Territories have mine closure policies requiring companies to develop site-specific post-mining rehabilitation plans for approval by the relevant mining agency. All jurisdictions require some form of security bond, but the calculation process for bonds varies.

A recent national initiative was the publication in 2000 jointly by ANZMEC (the Australian and New Zealand Minerals and Energy Council[8]) and the Minerals Council of Australia of a *Strategic Framework for Mine Closure*. The objective of mine closure is to prevent of minimize long-term environmental damage, and to create a self-sustaining natural ecosystem or other land use based on an agreed set of objectives. The *Strategic Framework* is a set of general guidelines for all jurisdictions. It addresses objectives and principles under the six key areas of stakeholder involvement, planning, financial provision, implementation, standards and relinquishment. It does not address the issue of abandoned mines. It is not comprehensively detailed and assumes that governments (the various jurisdictions) and industry will develop complementary regulations and guidelines to advance the process of effective mine closure.

The case of Western Australia, regarding regulatory requirements and procedures, provide an example of how the environmental control of mining projects may be handled. In this jurisdiction, the responsibility is shared between the Department of Environmental Protection, on behalf of the Environmental Protection Agency (EPA), and the department of Minerals and Energy. If a project has the potential to create a significant effect on the environment it is forwarded to the EPA for assessment. However, the Department of Minerals and Energy[9] handles most of the day-to-day control of the mining industry with the Department of Environmental Protection having an auditing and referral role. (Lindbeck, K and C. Murray, 1995)

2.1.2 United States

The U.S. experience with legally required closure planning, according to Danielson and Nixon (1999), has been very positive in most respects. Often, significant environmental

[7] The Act only covers matters of national environmental significance and Commonwealth land. Outside of this, State/NT statutes/regulations apply.

[8] ANZMEC — a Council of Ministers with responsibility for minerals and energy in all jurisdictions in Australia, and the New Zealand Minister for Energy. The Papua New Guinea Ministers for Mining and Petroleum and Energy also have observer status. ANZMEC promotes the general welfare and progressive development of the Australian mining and minerals industry, and consults on the nation's energy needs, resources and policies.

[9] The Department of Minerals and Energy (WA) became Department of Mineral and Petroleum Resources as of 1 July 2001.

benefits have been achieved at little or no cost, simply because proper advance planning results in pollution prevention. For example, it may cost nothing to place tailings outside a stream bed, not to dump used crankcase oil on the ground, or to achieve an acceptable slope on a waste dump if these steps are planned from the beginning. By contrast, moving the tailings out of the river, cleaning up petroleum-contaminated soil, or recontouring an established waste dump can be enormously expensive if no attention is paid to these issues until the mine closes. Further, mines almost always close when they are losing money and their operators are strapped for funds and facing a variety of other challenges. This is a poor time to be doing closure planning, and almost a guarantee that it will not be done well.

On the other hand, it is somewhat more difficult to predict the future course of US mine reclamation regulations.[10] While the Surface Mining Control and Reclamation Act, SMCRA, is widely seen as a highly effective piece of legislation, it is unlikely that it will be used as a model for future regulations governing hard rock mine reclamation. The Surface Mining Control and Reclamation Act, SMCRA, is expensive to administer and unlike the US coal industry, these costs cannot easily be passed on to the consumer. In addition there are important differences in the today's political climate that make replication of the Surface Mining Control and Reclamation Act, SMCRA, highly improbable. What is a more likely scenario is in the future there will be a continuation of the existing incremental approach taken by the states to strengthen their reclamation legislation. This means that in the US there will continue to be a patchwork of laws of varying effectiveness and severity governing how hard rock mines will be reclaimed. In the absence of any standardized laws that are specifically written to address reclamation, the emphasis will remain with the mining industry to develop and follow best management practices if the existing situation is to substantially improve.[11]

In the State of California, there are a number of different agencies administering their own laws and regulations that apply to mine closure. The two most important are the local agencies that control land use and the state agency that is responsible for water quality protection. The land use laws regulate post mining land use and assure that the final topography, drainage, resoiling, revegetation, etc., is appropriate to support that post mining land use. The Water Quality Control Board, on the other hand has jurisdiction over what it is called "mine waste units." These include waste rock dumps, tailings ponds, spent heaps, etc.

The water quality law requires that waste disposed to land be managed within engineered waste containment units to assure that the waste will not, either during operation or after closure, impair the beneficial uses of the waters of the state, essentially a zero degradation standard for usable ground and surface water.

The regulations include prescriptive engineering standards that can be generally used (such things as liner systems, leachate collection, closure caps, etc) but also allows the operator to

[10] According to professor Marcello Veiga, it seems that one area where future change is bound to occur is in legislation intended to address the ongoing problem of Abandoned Mined Lands, AML. There is little utility in creating laws that limit pollution from existing mine sites if nothing is done to address pollution from historic mined areas. How and when these laws will take effect remains a source of much speculation, but this is an issue that must eventually be addressed.

[11] Veiga et. Al. 2000.

proposes "alternative engineering" to the prescriptive standards that, because of the particular nature of the waste, or the disposal site, will provide equivalent water quality protection. Other agencies also have jurisdiction, but often indirectly, by providing advise to the land use agency. For example, the Fish and Wildlife agency can offer comments and suggestions on the post mining land use and the reclamation if the intent is to provide wildlife habitat.

Within the aforementioned context, the question is whether it makes sense to have one agency or several? There are arguments in favor and arguments against either alternative. Certainly all aspects of a mine closure need to be integrated in to a single plan and multiple jurisdictions raise the prospect of conflicting requirements and bureaucratic disputes. On the other hand, the training and skills required for water quality protection engineer are quite different from those which apply to land use, soils, revegetation, etc.

At the same time, it depends on the level of government that is appropriately involved. California is such a big and diverse state, that it has been concluded that land use decisions and the accompanying reclamation requirements are better made at a local level (although there are state standards that have to be met and a state agency that provides technical support and oversight) while water quality protection is a state-wide issue administered by a state agency with regional offices. Some states assign primary responsibility for mine and mine closure regulation to one agency but require them to consult with and incorporate the requirements of other special focus agencies.[12]

As a preliminary conclusion, it probably would work better to have one or only a few laws governing mine closure. But that would be difficult to do in the U.S. where there has been a long history of legislation dealing with a host of circumstances, many of which may touch on some aspect of closure. One example of legislation that works well is the Clean Water Act (CWA). The CWA is a National law affecting closure by setting standards for water quality. Although, this is a National law the States had the option of administering the program. Many do, designing an administrative a program meeting the requirements of the Act but which also meets the particular circumstances of their State.

2.1.3 Papua New Guinea

There are no comprehensive policy on mine decommissioning and rehabilitation of mines in Papua New Guinea to guide proponents to undertake appropriate and successful rehabilitation. Furthermore, decommissioning and rehabilitation of exploration sites are inadequately catered for in both the Mining Act and Environmental Planning Act- two of the key national legislation dealing with the subject.[13]

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[12] Krauss, Ray 2001.

[13] Closed mines during the last 15 years include Bougainville Copper, Mt. Victor and Renison Gold. Bougainville Copper – a very large copper producer closed in 1989 by the outbreak of violence against both the mine and PNG by the Bougainville Revolutionary Army that sought independent statehood for Bougainville. Mt. Victor, a small gold mine closed c 1994 when reserves were exhausted. Small miners invaded the site and undid much of the good rehabilitation work. Renison Gold operations at Wau – a medium sized gold mine that had operated for several decades closed c.1995 as uneconomic. The area surrounding it is a seventy-five year old alluvial field and continues to support several thousand small miners. The Hidden Valley project

Consequently, the Department of Mineral Resources (DMR) and the Office of Environment & Conservation (OEC) have taken the initiative to co-develop a policy, which will be incorporated into a legal framework. The Department of Mineral Resources, DMR, and the Office of Environment & Conservation, OEC, have established an Inter-agency Mine Decommissioning and Rehabilitation Committee to formulate the policy and subsequent guidelines to be possibly incorporated under the new Environmental Bill 1999.[14]

On this regard, comprehensive policy guidelines are being discussed in PNG for future mining projects to ensure that decommissioning and rehabilitation issues are properly and adequately addressed and planned for before the commencement of a mining project. These policy guidelines will therefore, be enforced under the new Environment Bill and necessary amendments made to the Mining (Safety) Act to include the requirements of mine closure planning and decommissioning.

Furthermore, the policy guidelines should include decommissioning and safety aspects of off shore mining to ensure that structures put up in the off shore areas are completely removed after closure for navigational safety.

Government in Papua New Guinea is proposing to have all issues relating to closure and decommissioning under the Mining Act. It has also been proposed that rehabilitation and post closure monitoring be included also in the Mining Act but have those provisions administered primarily by the Environment Department with coordination and assistance from the Mining Department.

Within this context, it seems better to have it all coordinated under one Act in order to ensure there is no confusion of responsibilities and to ensure that major issues do not "fall between the cracks" between different government agencies operating different Acts and blaming each other for the problems as they arise. It is very easy for a Mining Company to exploit weaknesses, especially where they are not specifically dealt with by either Act, and if

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currently in feasibility stage lies nearby. Existing larger mines include the mines of Misima, Ok Tedi, Porgera, Lihir, and Tolukuma. 1. Misima – gold, 3.3moz produced, mining now ceased, milling of low grade ores will continue for three years. Workforce reduced by 60% this year. Detailed, agreed closure plan in place. 2. Ok Tedi – large scale copper – draft closure plan in place but likely to continue operations until 2011. Right now, operators, BHP-Billiton pulling out and handing over to PNG government. Sustainability planning well under way – but a difficult region to work in. 3. Porgera – large scale gold, 11moz to date – closure planning begun and a sustainability process in place for 3-4 years. Mining to stop in 2005 then milling only to 2010. 4. Lihir – large scale gold opened only 4 years ago with an expected life of 35 years. No closure plan as such as yet but financial provision for closure made monthly. 5. Tolukuma – a small gold mine open for five years has another five left. Isolated served entirely by helicopter. Few closure implications are officially foreseen.

[14] According to Richard Jackson, there is some confusion since there are no specific closure laws other than the safety regulations contained in old mining legislation, which, according to the aforementioned author, is reasonably adequate except for long-term environmental safety issues. Ideally, legislation is urgently needed. However, its absence will not cripple individual closure plans. It is more likely that the failure to push through closure legislation is symptomatic of a wider weakness- that of any level of government being able to do anything constructively and thoroughly.

there is a separation of responsibilities under different Acts. It is much harder to do so if there is a single coordinating agency and Act.[15]

Today, the PNG experience is that various government entities are involved in the closure process and each has different areas of responsibility. For example, the Mines Inspector endorses final decommissioning while Office of Environment deals with rehabilitation and post closure monitoring. A multi-sectoral Closure Committee is set up to prepare a Final Mine Closure Plan which then has to be approved by the National Executive Council. In this case, it would seem that an independent law is unlikely to succeed.

Regulatory bodies need to develop mine closure policies that can be linked to mining legislation or mining development contracts. It is best to limit the number of applicable pieces of legislation. In PNG, three pieces of legislation that would normally apply are Mining Act, Mining Safety Act and Environment Act. Agreements or a Code of Practice makes closure more flexible ensuring that closure practices adapt as the industry knowledge and practices improve.[16]

Now, regarding successful and failed examples of mine closure, the thinking by the mining industry, governments, NGO's and international agencies in relation to mine closure is relatively new so there are not many examples to look at regarding successful and failed examples of mine closure. However the closure of Island Copper on Vancouver Island is viewed as an example of successful closure. There are few examples that exist for high rainfall, steep terrain environments such as Ok Tedi. [17] In PNG only two small gold mines have closed in recent years and another put on care and maintenance.[18]

2.1.4 Canada

The Federal Government of Canada is responsible for mine closure and mine reclamation in the Yukon Territory, Nunavut and the Northwest Territories. Minerals and metals activity throughout the rest of Canada (excluding some uranium mines) are managed and regulated by the provincial governments.

In Canada, according to Claussen, policy framework continues to evolve: devolution of federal regulatory responsibilities to regions and territories, Aboriginal control over lands and resources; new land planning and Environmental Assessment, EA, regimes. In this regard, policy must be based on both scientific rigor and adaptive approaches: consideration of socio-economic and cultural elements. Regarding pressures, if receivership or cash flow problems are imminent, operator may ask for concessions--a benefit for those depending on the mine for employment, but a concern for others. Finally, provisions for stakeholder engagement and participation in decision-making must exist.[19]

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[15] Hancock 2001.
[16] Kennedy, Mike 2001.
[17] Kennedy, Mike 2001.
[18] It seems that Rehabilitation work undertaken at both mines that closed was interfered with by local communities looking for gold.

[19] Claussen, Scott. Federal Approaches and Management Issues Associated with Mine Closure and Reclamation in Canada. Pan-American Mine Closure Workshop, Santiago, June 2001.

From a policy perspective, it is possible to reproduce the Canadian government priorities, distinguishing between existing and new mines. Key priorities regarding new mines are the following:

- To develop reclamation and decommissioning standards that are in-keeping with other standards in Canada and elsewhere
- The environmental assessment process must cover closure options, processing and ongoing reclamation
- To appropriate terms and conditions for site reclamation and decommissioning: through permits and licensing procedures
- To ensure that closure plans are updated and that sufficient financial security (bonds, assurances, etc.) in place prior to development
- To effectively conduct inspection and enforcement.

Key Priorities regarding existing mines are the following:

- When a mine operator has become insolvent or is unable to finance the costs of reclamation, responsibilities revert to the Federal Crown
- If ownership has reverted to the Crown, the Government must conduct an independent environmental assessment (EA) and site-decommissioning plan
- Risk assessment must be completed; both financial and physical
- Procuring financial resources: targeting past owners through waste management regulations, or joint public/private funding programs

Considering the aforementioned priorities, the Canadian government has identified several challenges that should confront regarding mine closure policies:

- Reclamation Plan: Ensure that financial securities are not spent by the operator on other concerns
- Reclamation plan must incorporate concerns/participation of other stakeholders
- If ownership reverts to the crown:
- Locating mine management and geological records is difficult
- Creditors' claims on the site may modify decisions
- Legal considerations for ownership: target past owners, etc.
- Long-term maintenance funding i.e. acid generating, etc.
- How to maintain control over tenure if leases expire and another party wants to obtain rights to the surface/subsurface
- Site inspectors must have appropriate credentials.
- Research: conduction, testing and integration

- Monitoring: many Aboriginal and local communities demand a role in site monitoring and access to information to ensure accountability of operator and governments: How to?
- Education: it is vital that communication exists between private and public bodies to improve closure policy and regulations
- Finding sufficient finances for clean-up; disaster; spills, particularly for orphaned sites
- Determining size of bonds.[20]

As with any federal country, the first question that should be answered regarding Canada is whether the Federal government or the provinces have the responsibility for mining. The answer is that this responsibility has been given by the Constitutional order to the exclusive domain of the provinces. In this way, with respect to mining, there is nothing in Canadian mining law that is comparable to the SMCRA in the US. The situation in Canada is similar to the US in the sense that like the states, each province is responsible for developing policies and regulations governing how mined lands are to be reclaimed within their jurisdiction.[21] Historically, the laws have been written in a way that government inspectors are awarded a high degree of discretion in terms of how they interpret the regulations (B.C. Ministry of Employment and Investment, 1997)[22].

With different emphasis and styles, the Canadian Provinces have enacted mining related Acts for the administration of abandoned mines and mine reclamation. In effect, this is the case in Newfoundland and Labrador, Nova Scotia, New Brunswick, Quebec, Ontario, British Columbia and Yukon. In Saskatchewan, Northwest Territories, Nunavut and Yukon government regulators rely instead on environmental related legislation. In Alberta the Coal Conservation Act is used. Manitoba has written a policy document that covers the administration of Abandoned Mines Lands, AMLs. However, the federal government does have some related legal attributions.[23] In effect, "at the federal level, Ottawa can use sections of the Environmental Assessment Act, Environmental Protection Act, Fisheries Act, and Atomic Energy Control Act to manage the reclamation of AML sites on federal land."[24]

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[20] This specific list has been presented by Scott Claussen, from Natural Resources Canada, in Claussen, Scott. Federal Approaches and Management Issues Associated with Mine Closure and Reclamation in Canada. Pan-American Mine Closure Workshop, Santiago, June 2001.

[21] Veiga, Marcello, Stephen Roberts, Carlos Peiter, Glória Sirotheau, Maria Laura Barreto & Gilson Ezequiel. Filling the Void: The Changing Face of Mine Reclamation in the Americas. Department of Mining and Mineral Process Engineering, University of British Columbia, Vancouver, and CETEM - Centro de Tecnologia Mineral, Rio de Janeiro, 2000.

[22] B.C. Ministry of Employment and Investment (1997). Health, Safety and Reclamation Code for Mines in British Columbia, Victoria, BC, Canada. ISBN 0-7726-3150-6.

[23] Veiga, op. cit., remind us that Federal laws also play an important indirect role in how mines are reclaimed. The Canadian Environmental Assessment Act (CEAA), the Canadian Environmental Protection Act (CEPA) and the Fisheries Act can substantially affect not only the way mines are operated, but on occasion these laws have been applied to direct how mined lands are to be reclaimed.

[24] Veiga, Marcello, Stephen Roberts, Carlos Peiter, Glória Sirotheau, Maria Laura Barreto & Gilson Ezequiel. Filling the Void: The Changing Face of Mine Reclamation in the Americas. Department of Mining and Mineral Process Engineering, University of British Columbia, Vancouver, and CETEM - Centro de Tecnologia Mineral, Rio de Janeiro, 2000.

Regarding Canada and the United States, while predicting the future is inherently difficult, we can, with some measure of confidence, speculate on where the future of reclamation regulations are headed by looking back at the regulatory path that has so far been traveled. Beginning with its initial concern for issues of human health and safety, the regulations have over time evolved to the point where almost an equal emphasis is now placed on the preservation of environmental values. This evolution has come about in response to heightened public awareness and concern over issues relating to the environment. It would seem unlikely that in the near or medium term this trend will be reversed.[25]

Veiga thinks that while acknowledging that the current emphasis on environmental protection is likely to continue, recent changes in the political climate in Canada and the US suggests that other important changes are coming. In an effort to combat high government deficits, both countries have adopted a series of fiscal measures aimed at reducing their direct involvement in the economy. In Canada[26] the result of this policy has lead to a gradual move away from a centralized regulatory regime to one that provides the industry with much more discretion over the ways and means it uses to meet the government's broad policy objectives. As a result of these changes to the legislation it is likely that in the future the job of government inspectors will change from a proactive to a reactive role.[27]

While the potential exists for some industry players to cut corners in an effort to increase their relative competitive advantage, in general the large companies have, at least publicly, committed themselves to the principle of environmental stewardship. What is more problematic is how medium and small mining companies will respond to the less restrictive regulations.[28]

Nowadays it is more or less accepted that project proposals and investment plans should include provisions for full decommissioning. This is the case in Ontario. The Ontario Ministry of Northern Development and Mines in Canada produced a technical document "Rehabilitation of Mines: Guidelines for proponents." Which sets out principles objectives, and criteria for a mine closure and rehabilitation plan. Mining and quarrying companies in many countries now produce plans, which apply these, or similar guidelines to both existing mineral operations and to new proposals.[29]

2.1.5 Chile

Currently, there is no comprehensive mine closure legislation in Chile. There are several Acts that deal one way or another with the issue of mine closure. Among these pieces of legislation special consideration should be given to the Framework Law for the Environment[30] and its By-laws on Environmental Impact Evaluation. [31]The system of

[25] Veiga et. Al. 2000.
[26] Ontario and to a lesser extent British Columbia have initiated a series of changes to the existing regulations in the hope of not only reducing their costs for overseeing the industry, but also to remove some of the perceived barriers to the economic competitiveness of the mining sector.
[27] Veiga et. Al. 2000.
[28] Veiga et. Al. 2000.
[29] Choppin N. J. and J. Box 1999.
[30] Ley de Bases Generales del Medio Ambiente, N° 19.300, 1994.
[31] Reglamento de Evaluación de Impacto Ambiental, 1997.

environmental impact assessment establishes that mining projects should include a reference to mine closure within their Environmental Impact Studies. There is growing criticism regarding this legal requirement in the sense that it does not specify the mentions it should contain. Furthermore, there is no previously established system to properly control the execution of the commitments the mining operator state in his/her Environmental Impact Study.

2.1.5.1 National Process

The Chilean Government is currently engaged in a process that would see different aspects of the mine-closure procedures in order to create a more holistic set of rules and regulations for the mine industry. At this point, the Chilean Copper Commission, COCHILCO[32] has been commissioned by the Minister of Mines of Chile to carry out investigations on mine-closure, abandoned sites and mining towns to establish liabilities and technical, social and political guidelines for the matter. This project has been observed by other North and Latin American governments with potential to use the recommendations as a basis for future regulations in these countries.[33]

2.1.5.2 Regional Process

In parallel to the process mentioned in the previous paragraph, the Chilean government is involved since 1999 in a regional process to advance the enactment of comprehensive mine closure systems in the different mining countries of the region.

In May 2001, within the context of a Annual Conference of the Ministers of Mines of the Americas, CAMMA, preparatory meeting in the United Nations Economic Commission for Latin America and the Caribbean, ECLAC in Santiago, a Draft Memorandum of Understanding was presented to the delegates for their consideration. The title of the document is "Memorandum of Understanding: General Non-binding Principles for Mine Closure in the Americas"

The purpose of the Memorandum of Understanding was to assemble a theoretical basis for the policies on mine closure each country has implemented, is implementing, or will implement. It assumes that there are principles common to all countries governing such policies and that a harmonization of these principles could be used for the further development of national policies. This is especially true in an era in which the various

[32] The Chilean Copper Commission is a government agency whose mandate includes: 1. To elaborate, propose and implement policies that promote the permanent development of the mining sector, both public and private, within the context of a global and highly competitive economy. 2. To enforce and monitor the accurate and timely compliance with laws, regulations, norms and procedures that applies to the public and private mining sector. Likewise, support the control of the application of those legal bodies in which the institution can contribute thanks to its particular expertise. 3. To safeguard the interests of the State in its enterprises, helping to formulate long term goals and evaluating their subsequent fulfillment to ensure the achievement of the objectives of the State-owned companies and the optimal use of the State's resources.

[33] Veiga et. Al. 2000.

countries of the Americas are experiencing increased contact and exchanges.[34]

The first part of the Memorandum of Understanding sets out the basis for its creation and the importance of the theme dealt with, namely, that of mine closure. The various ideas expressed in this section may be found in the declarations and decisions made and taken within CAMMA.

The justification for formulating common principles for mine closure within the Latin American region through a Memorandum of Understanding arises out of CAMMA process, especially the matters discussed and subsequently agreed upon within a meeting of the Ministers of Mining and it has been a recurrent topic of the various previous CAMMA meetings.[35]

The agreements reached at the preparatory meeting of experts at the Fourth Annual Conference of the Ministries of Mining of the Americas held in Buenos Aires in June 1999, set out a draft action plan for 1999, "Study and Exchange of Information on Abandoning and Closing Mines" (20/99), whose principal objective was to study the legal and institutional framework governing the matter at the regional level, including the subsequent use of the land affected by such actions, and the environmental, social, and economic concerns accompanying the same.

The Caracas Declaration constituted an agreement by CAMMA member countries to carry out studies and exchange information regarding mine closure. Chile's Ministry of Mining sponsored a First Constitutive Meeting of those countries connected with such closure and whose objective was to prepare and define a regional focus on mine closure on the basis of already-existing CAMMA objectives. This so-called constitutive meeting took place on 16 September 2000 and was coordinated by the Chilean Copper Commission. Participating in this meeting were official representatives from Argentina, Bolivia, Canada, and United States as well as the Director for the Mining Policy Research Initiative of the International Development Research Center, Government of Canada. Although Brazil, Mexico, and Peru sent their regrets to this first meeting, they nonetheless indicated their interest in participating actively in any proposed initiatives.

The aforementioned meeting produced a number of interesting presentations concerning Chile's vision and proposals for a regional undertaking, as well as the experiences of Canada and United States in the implementation of their regulatory systems, as well as other legal, institutional, financial, economic, and technical aspects of the matter. The debate centered on the idea of a regional undertaking in order to form a coordinated front for dealing with the challenges faced when implementing mining policies within a context of sustainable development.

The participants at the aforementioned meeting adopted a number of important conclusions and agreements:

[34] The ideas contained in the document are, in both their form and content, in the nature of propositions open to full discussion and debate by each delegation within CAMMA. The result of these discussions will be a final text to be submitted for consideration by the Ministers of Mining at the meeting in the Dominican Republic in November 2001.

- The representatives from Canada and United States, both of which have well-developed systems governing mine closure, committed themselves to increased efforts in supporting the regional process;
- There was agreement on forming a Regional Working Group made up of official representatives from Argentina, Bolivia, Brazil, Canada, Chile, United States, Mexico, and Peru whose purpose would be to act as facilitator and coordinator for regional mine closure initiatives;
- The aforementioned Working Group was to be created under the aegis of the objectives and purposes of CAMMA;
- The participants at the meeting agreed that the coordination of the Regional Working Group[36] would be Chile's responsibility, and that this country would organize an Executive Secretariat based at the Chilean Copper Commission; and
- To this purpose, the same Executive Secretariat was charged with formulating a draft Memorandum of Understanding;
- The Mining Policy Research Initiative of the International Development Research Center decisively supported the idea of a regional Memorandum of Understanding for mine closure policies;
- The representatives from the region's various countries have expressed an interest in and have supported such an initiative.

In spite of the diversity amongst the various CAMMA countries regarding current, or pending, mine closure systems, it is thought that some principles are generally pertinent to all cases of mine closure. The draft memorandum of understanding seeks to bring together those principles, in each category, that may be common to any mine closure and which may serve to orient the policy efforts of those countries currently engaged in designing a mine closure policy regime, or those wishing to modify or modernize an already existing policy.

2.1.6 South Africa

Legislation in South Africa governing mining has been in existence for many years and periodically undergoes review and amendment. The last major change before the one currently underway, was in 1991 when there was an attempt to consolidate a number of different laws dealing with precious metals, diamonds and base minerals.

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[35] CAMMA meeting, Vancouver, October 2000.

[36] As the mine closure policy regime is debated and discussed, there should be some indication of the manner in which it would carry out its proposed operations. In September 1999, a number of countries approved the creation of a Working Group whose purpose was to coordinate efforts at developing, strengthening, and improving national policy regimes of mine closure, searching for sources for financing such undertakings, and establishing forums for further exchanges of opinions and experiences. The Memorandum of Understanding would be the appropriate space for setting out the functions and responsibilities of this Working Group, including its operational procedures, its decision-making structure, the schedule of its meetings, any other matters directly pertaining to its activities.

The law has national scope and for the entire operation, prospecting and the governance of minerals rights. A new law called the Mining and Petroleum Draft Bill has just been released.[37]

Some experts[38] believe that it is probably best to have one source of mine closure law (this could be either in the mining legislation or in some other legislation) as long as where it is, it covers all the aspects that need to be covered for effective mine closure and is endorsed by all the relevant government bodies. There has been critics in the past that a Ministry of Mines cannot both promote mining and regulate it and that the regulation (particularly in the case of environmental issues should be addressed by some other institution like for instance an EPA). Whatever the case it seems that a mine proponent would want to be able to go to one source to be able to ascertain the legal requirements for mine closure. The decision-making and regulation is a different issue.

One important consideration for such legislation is that any decisions on the closure requirements and whether proper closure has taken place, should be done co-operatively within government e.g. by an inter-governmental institution including representatives of government/state departments who have responsibility for the protection of the environment, water soil etc and social issues.[39] This is to ensure that there can be no conflict between the different interest groups.

Main drawback regarding mine closure is providing adequate level of assurance to government departments (specifically water affairs) that operational risks have been adequately managed, and that possible residual risks have been identified, quantified, and sufficient financial provision and / or technical measures are in place to manage them, should they manifest. Many closures have been arrested due to the inability to provide assurance to government on this. The level of assurance has not been defined by government (i.e. in terms of what level of risk they will accept).

Regarding alternatives of responsibility when government capacity does not exist or is not sufficient, it is important to consider that at the end of the day when the mining company no longer exists the government or community will be left with whatever legacy is left behind. To attempt to deal with this mining companies can establish Foundations to address community and social issues and the Foundation can be structured so that it exists for a period of time after mine life. A role that the Foundation can play is to work with the government to assist the government to develop the capacity that it lacks.[40]

In parallel, it could be used "accredited" auditors or technical specialists to assess residual risks. Is currently a business model whereby a company assumes responsibility for closure liability, and is paid for doing so by the mine.

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[37] See www.anc.org.za

[38] Dixon 2001.

[39] It should also be considered the problem of multiplicity of agencies to get the necessary permits for mine closure.

[40] Kennedy, Mike 2001.

2.1.7 The Philippines

The Mines and Geosciences Bureau (MGB)[41] is about to release the second draft of the "National Minerals Policy: Promoting Sustainability Through Responsible Mining". In this document the Government affirms its commitment to mine closure and in the management of abandoned or inactive mines. The major objectives of mine closure under this framework are:

- To return the land to a physically and chemically stable state and self-sustaining ecosystem based on a final land use agreed with the host communities and local government, and
- To ensure sustainable livelihood opportunities for the host and neighboring communities.

2.1.8 Japan

In Japan, mine development, mine safety and mine pollution prevention is structured on the following pieces of legislation:

- Mining Law[42]
- Mine Safety Law[43]
- Law Concerning Special Measures against Pollution from Metal Mining (Special Law)[44]

Additionally, the whole system functions under the control, supervision and guidance of the Ministry of Economy, Trade and Industry (METI).[45]

There are no specific terms and definition for mine closure in the Mining Law, Mine Safety Law, and Special Law. Article 59 and 60 of the Mining Law provides rules regarding acquisition, change and extinction of mining rights. From the analysis of these norms it is possible to deduce that mine closure will begin at the moment of the expiration of the

[41] The Mines and Geosciences Bureau (MGB), a line agency under the Department of Environment and Natural Resources (DENR), is the primary Philippine government agency responsible for the development and management of the country's mineral resources. MGB certifies environmental and community relations records relating to mining; evaluates environmental and social compliance documents from exploration to mine closure; carries out environmental monitoring and auditing and environmental research; establishes environmental and social guidelines or standards; and provides technical assistance to local governments, small scale miners and the general public. However the Environmental Management Bureau (EMB), a sister agency under the DENR, issues Environmental Compliance Certificates (ECC) for a mining project after review and evaluation of its Environmental Impact Statement.

[42] Enacted in 1950. The first law related to mining in Japan was enacted in 1873.
[43] Enacted in 1949.
[44] Enacted in 1973.
[45] Formerly, MITI.

mining right.[46] In parallel, the Mining law defines abandoned mines as mines that will not be able to be redeveloped after the end of the mining operation.[47]

In accordance to aforementioned, in Japan there is no specific law entitled "Mine Closure Law". Mine closure is one of the stages of mining, including exploration, development and operation[48], and the Mining Law, Mine Safety Law, and Special Law regulate it. Article 62 of the Mining Law establishes that the holder of the mining right should submit and get approved a "mining plan".[49] The mining plan requires statements from the mining operator regarding the issues of mine closure and abandonment of the mine.[50]

Article 4 of the Mine Safety law establishes that the holder of the mining right has obligations for damages and mine pollution. Article 26 of the same law establishes that the Director of Mine Safety Inspection Department is able to order the construction of necessary facilities and other measures to the holder of the mining right for the damage caused by the operation or mine pollution, up to five years after the expiration of his/her mining right.

Article 7 of the Law Concerning Special Measures against Pollution from Metal Mining establishes that the holder of the mining right needs to reserve necessary funds for mine pollution prevention projects in used facilities.[51] In article 12 of the same law, there is a requirement to the holder of the mining right in the sense that he/she should provide funds for permanent wastewater treatment.[52] Regarding coal mining there are other specific norms.

In Japan, in general, laws related to mine closure are from a national level.

Taking into consideration that for the Japanese government the survival of the mining town after closure is a main policy issue, the system is organized in a way that facilitates the welcoming and placement of a new industry that replaces the mining industry, and the creation of new jobs for the local community.

Generally, the company will decide mine closure and it will be based on economic considerations. There is no responsibility for the company to compensate social and economical loss by the local community produced because of mine closure.

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[46] Uematsu, 2001.

[47] Regarding environmental laws, general laws on each environmental component such as air and water quality are regulated and guided by the Ministry of the Environment and are applied to all industries, mining included. Now, the Mine safety law, because it is a specific and particular law, is applied with pre-eminence to any other environmental law.

[48] And abandonment, when it applies.

[49] The Director of Mine Safety Inspection Department that commands and controls mines under the Mine Safety Law discusses the mining plan.

[50] The distinction between abandoned mines and mines without a person in charge is as follows: Abandoned mines are mines that suspend their operations for more than one year in a way according to the Mining law. Mines without a person in charge are mines without a person holding a mining right.

[51] It is called "Reserve fund Scheme".

[52] It is called "Funding Scheme."

However, in Japan, under the viewpoint of "social liability" (not implying legal responsibility), the company is invited (voluntary basis) to provide mining related projects and create new employment opportunities after mine closure.

Examples of "social liability" are the following:

- To develop an environmental industry such as industrial waste treatment industry and recycling industry by making the best use of technology, facility and workers from the refining industry.
- To develop a tourist industry by using the space of the mining area.
- To relocate other facilities of the company (currently in other areas) within the perimeter of the mine operation.
- To shift the refinery facility from concentration to metal recovery.
- To create new jobs for the mineworkers within the framework of other companies or mines.
- To secure living standards of the mineworkers by increasing extra retirement allowance.[53]

Additionally, the national authorities and local government create proactive measures to invite new industries and a preferential tax system for these industries. On the same token, for the unemployed workers, the government creates educational and training opportunities for them to acquire new skills for new jobs. A vocational training system has been established as a part of labor Policy and in this regard it is possible to observe that Japan has made an effort to reduce the impact of mine closure.[54]

Historically, mine pollution during mining operation and after mine closure have caused damage to the health of people in general and to the local communities in particular. Therefore, from this background of social issue, prevention of damage during and after mine closure is one of the important measures in mine closure.

Japan prevents new accumulated mine pollution by complimenting each effort of the holder of the mining right, national government, Metal Mining Agency of Japan (MMAJ), and local government. In this sense, mine closure has been successful.

The Ministry of Economy, Trade and Industry (METI), that has a supervising role of the whole mining industry, has enacted a number of measures related to mine closure:

- In proceeding with mine closure, Japan ends mining operations by streamlining operation and workers.
- The Mine Safety Inspection Department, under administrative guidance, requires the mining company to submit a "Mine Safety Plan under Streamlining" and a "Mine Closure Plan" according to the stage of streamlining and mine closure. The Mine Safety

[53] Uematsu 2001.
[54] Uematsu 2001.

Inspection Department conducts site inspections and gives guidance to take appropriate measures in case of danger or mine pollution.

- According to the Mine Safety Law, it is possible to give "order to establish necessary facility for prevention of danger or mine pollution" to the holder of the mining right up to five years after the expiration of the mining right.

In Japan, the following system has been established to prevent mine pollution from the stage of operation to after mine closure:

- Subsidy system of the government for mine pollution prevention works conducted by the local government or the holder of mining right.
- Guidance and consulting system for mine pollution prevention measures and works conducted by local governments.
- Financing system for the mining company that is conducting a work of mine pollution prevention.
- Reserve fund system for necessary funds of mine pollution prevention works.
- Funding system for securing necessary funds for mine waste water treatment.

It is difficult to evaluate whether mine closure has been a success or a failure from the viewpoint of microeconomics because both, operation and closure have political, social, industrial, technological and environmental factors intertwined and there are no previously agreed evaluation standards to work with. Regarding the case of Japan, by looking at the fact that danger to the population or mine pollution is prevented by the effort of stakeholders in the country, local government and the company, it is possible to state that Japan has been successful. Currently, there is no serious mine pollution.

Finally, since the closure of a mine will provoke a significant impact to the local community from social, economical, and environmental aspects, the parameters for mine closure evaluation standards are to reduce and minimize these impacts and prevent pollution.

2.1.9 Brazil

The Brazilian Mineral Production Department (DNPM) has created a Work Group for the elaboration of the Mining Rules. The basic text resultant of this work is now available in the site "www.dnpm.gov.br" for analysis and suggestions from the community. This text proposes that, before the temporary or definitive break in the activities, the mining companies should submit to DNPM a Closure Plan, containing the measures related to environmental control, including those which refer to mine reclamation.[55]

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[55] Brazilian mining contributes significantly to the national economy, in the formation of GNP, generation of employment and exports. It represents 4.5% of the value of GNP, excluding petroleum and gas. It is particularly important due to the effects that it brings into the productive structure, including trade sectors and the transformation industry (metallurgy, cement production, chemical industry, ceramic and glass industries). The number of direct jobs - 230 thousand - generates the creation of 920 thousand other jobs in the trade sector and 1286 thousand in the transformation industry. The participation of the State of Minas Gerais in mineral

In this context, the mechanisms proposed to assure mine reclamation, which is part of the mine closure plans, have gained great importance in the definition of the governmental policies and in the strategy of the companies.

2.1.10 Bolivia

Bolivia is the only country in Latin America that has a specific regulation for the environmental management of mine-closure and reclamation procedures. The regulations provide specific technical guidance for how the reclamation is to be accomplished once mining operations cease. To help ensure that the intent of the law is carried out, mining companies are required to develop a closure plan beginning from initial exploration. As in North America, these closure plans must address the objectives for the closure and reclamation, specify a program for closure,[56] and address post-closure actions (control and monitoring).[57]

In Bolivia, closure and rehabilitation of areas affected by mining exploration activities is regulated according to the following policy: Once concession-holders or mine operators carrying out exploration activities decide to undertake operational mining activities, they must present a closure report on those areas that are not included in their mining operations program or project. This report must be presented no later than twelve (12) months after the conclusion of the exploration program.

Closure and rehabilitation following mining activities: Concession-holders or mine operators must close down and rehabilitate the area of their mining activities both within and outside the perimeter of their concession area, when they have partly or totally concluded their mining activities, in accordance with what is established in the relevant Environmental License, or if they abandon their mining operations or activities for two or more years. Whenever possible, they must close down and rehabilitate the area of their mining operations while they are still carrying out their mining activities.

Post-closure actions involve controlling the structural stability of the accumulated residues and monitoring flows in drains, sedimentation ditches, tailings dams or back-fills. Once the measures to close down and rehabilitate the area have been carried out, and after a post-closure period of three years, during which emissions and discharges have been kept within the permissible limits established in the Environment Law's regulations and the accumulated residues have shown no signs of instability, the concession-holder or mine operator must present a report to the Competent Environmental Authority. This report

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production in Brazil is extremely significant, being responsible for the production of one third of the useful minerals. In spite of its economic importance and its current technology, mining activity is still regarded as one that brings about environmental problems deserving special attention from environmental agencies and legislators. The adoption of closure plans, which were formerly limited to special cases, is now part of the environmental policy of several countries and it can soon be considered in licensing procedures.

[56] Tailings control, physical and chemical stabilization of tailings, reclamation of the area and of superficial drainage, control of erosion.

[57] Veiga et. Al. 2000.

shall detail the closure, rehabilitation and post-closure actions carried out, and shall include an assessment of these actions and a description of the current state of the mining operations area.

The report must be accompanied by a favorable judgment by an independent auditor whose name appears in the Consultants Register. Mining activities will be considered concluded when the audited report is presented.

2.1.11 Ireland

In Ireland,[58] the way mine closure policy translates into practice is demonstrated by the two new zinc-lead mines, which have been developed in Ireland in the last five years at Galmoy, County Kilkenny and Lisheen, County Tipperary. These are the first such mines to be developed since 1974. Three main permits are required for mines in Ireland:

- Planning Permission which relates to Land Use issues and is administered through the relevant Local Planning Authority (such as County Council);
- Integrated Pollution Control Licence (IPCL), dealing with air and water pollution, noise and waste management, issued and administered by a national body, the Environmental Protection Agency; and
- State Mining Facility (Lease or Licence) issued by the Minister for the Marine and Natural Resources, concerned principally with mineral ownership and some other property rights.

Mine closure impacts on all three of these, but the main mechanism for control of closure planning is the Planning Permission. The agencies involved have cooperated with each other and the companies promoting these developments have also sought to be involved rather than having something imposed on them.

[58] Ireland does not have a substantial mining tradition, and only about 1 percent of the workforce is employed in mining. Mineral exploration beginning in the 1960s led to the discovery of a large deposit of zinc ore at Navan in northeast Ireland, where the Tara mine started mining in 1977. The industry has grown during the 1990s following development of world class lead – zinc deposits at Galmoy and Lisheen in 1997. Ireland remained a major European Union producer of zinc and an important producer of aluminum, lead, and peat in 1997. In that year Ireland produced over 3% of world zinc mine output and more than 2% of world lead output, and these percentages were expected to increase as the new mines came into full production. Ireland is now the largest producer of zinc concentrate in Europe. The Geological Survey of Ireland (GSI) was responsible for the development of mineral information and for technical management of the state mineral licensing and leasing system. GSI also provided technical assistance to the exploration and mining industries. Ireland's geology includes several lithological units and tectonic features that are favorable for the occurrence of several types of mineral resources. Interest in gold, lead, and zinc exploration provided the impetus for the revitalization of the exploration sector within the past few years. One of the cornerstones of current Government policy is to facilitate the creation of useful and productive new employment taking full advantage where possible of all of the country's natural resources. The minerals industry already makes an important contribution to the national economy and the Government believes it has the potential to increase that contribution significantly.

Before issuing a State Mining Facility, the Minister for the Marine and Natural Resources is obliged to advertise his intention to exercise his powers and invite submissions. Where this involves the licensing of third parties to work privately-owned minerals the Minister must give specific notice to anyone who "may appear to him to have an estate or interest in the minerals", and any submissions may be referred to an independent Mining Board established under the Minerals Development Acts to adjudicate on certain issues specified in the Acts.[59]

The concept of Integrated Pollution Control (IPC) has been growing in importance within the European Community in recent years. The main environmental objective of IPC is to prevent or solve pollution problems rather than transferring them from one part of the environment to another. Only one licence is issued to cover all aspects of waste, water, air and noise. In granting the IPC Licence the EPA must be satisfied that the Best Available Technology Not Entailing Excessive Cost will be used to prevent, eliminate, limit, abate or reduce an emission from an activity.[60]

The implementation of IPC[61] in Ireland will eventually cover about 1000 activities and is a phased process as outlined in the schedule of activities to which IPC applies. Lisheen is the first mining operation in Europe to be permitted under an IPC licensing system. The Lisheen IPCL contains the following conditions:

- Once all or part of the site is withdrawn from use or not used for over six months, the licensee must decommission, make safe or remove any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter container therein or thereon, that may result in environmental pollution.
- The licensee must maintain fully costed plans for the decommissioning or closure and perpetual aftercare of the site, and these plans must be reviewed annually.
- The closure and perpetual aftercare plans shall include as a minimum a scope statement for the plans; the criteria which define the successful decommissioning ensuring

[59] Both the Planning Permission and the IPCL provide statutory periods for comments or objections, and public submissions are invited within a statutory timescale. Consultation must also take place with certain Government Ministers, NGOs, farmers' representative organizations, heritage groups and other stakeholders. Appeals against Planning Decisions are heard by the national statutory independent appeals Board, An Bord Pleanála. Appeals against EPA decisions are heard within the EPA itself.

[60] The IPC licence takes account of the effect the activity has on the environment as a whole. In granting an IPC licence to an activity the EPA must be satisfied that the best available technology not entailing excessive costs (BATNEEC) will be used to prevent pollution. Industry can avail of the BATNEEC notes, that the Agency has prepared, to identify the technologies that can be used to eliminate, minimise, recycle, reuse and abate emissions and to determine the maximum level of emissions that will be permitted from new facilities.

[61] The main environmental objective of IPC is to prevent or solve pollution problems rather than transferring them from one part of the environment to another. Concentrating controls on a single environmental medium can serve only to create an incentive to release and/or transfer pollution from one medium to another. It also goes beyond the traditional framework of pollution control by encouraging the anticipation of the environmental effects of emissions, not just in the environmental medium into which they are released (for example, air) but also addresses the potential for those emissions to cross-over into other environmental media and cause harm to water and land.

minimum impact to the environment; a program to achieve the stated criteria; where relevant, a test program to demonstrate successful implementation of the closure or decommissioning plan; and a program for perpetual aftercare.

- In accordance with the user-pays principle, the licensee must pay to the Environmental Protection Agency at least £45,868 annually, or more if the Agency determines, towards the cost of assessment of matters specified in this license, including the monitoring of emissions.
- The licensee must establish and maintain a fund, or other form of approved security, sufficient to assure the Agency that the licensee is at all times financially capable of complying with the perpetual aftercare provisions. The licensee must revise the cost of perpetual care annually and submit adjustments for agreement by the EPA.
- Revisions to the perpetual aftercare fund must reflect indexation for inflation of the last cost estimate, and also allow for changes in compliance costs resulting from change in site conditions, changes in law, regulations, regulatory authority charges, or other significant changes.[62]

2.1.12 Spain

In Spain some legislation has a national scope, like the "Mining Law" but most of the legislation related to mining and the environment is regulated at the "Autonomous Region" level.[63] This legislative dispersion gives room for a significant diversity of norms and regulations regarding mine closure.

There exists a "Ministerial Order" that establishes the general system of mine closure in Spain. This Order has a national scope. The regulatory authority is the National State and the "Autonomous Regions'" local authorities. The law requires that a mine closure plan be prepared.

Perhaps one of the most interested issues regarding mine closure is that, together with Ireland, Spain as member of the European Union has a number of supranational commitments on environmental subjects that significantly influence national legislation and practice.

2.1.13 Peru

In Peru the government has produced for industry a manual for mine-closure and reclamation. However, use of this manual is considered voluntary.[64]

The current mining reform being carried out in Peru as to environmental matters includes new institutions, definition of jurisdictions and changes in the setting of standards. In general, the Peruvian State's environmental policy is guided by its commitment to give

[62] The formal Conditions include a written formula.

[63] An autonomous region is an administrative division of the territory peculiar to Spain, but it can be assimilated in most respect to a federal state.

[64] Veiga et. al. 2000.

adequate protection to the environment, trying at the same time to minimize obstacles for economic development.

Within this policy, it is considered absolutely necessary to stop the growth of and proceed to recover the "mining environmental liabilities", which comprises a large number of abandoned mines that contaminate and constitute a risk for persons. For this reason, regulations for the closure and abandonment of mines and the recovery of the liabilities of mining activities are being prepared.

The Environmental and Natural Resources Code[65] establishes an institutional framework for the revision and correction of environmental impact, under which the regulations of t he different sect ors have been implemented. The regulations for the protection of the environment of the Ministry of Energy and Mines (MEM), were passed by Supreme Decree.[66]

Titleholders of mining activities are responsible for controlling the emissions and the disposal of residues produced in their facilities. They is obliged to impede that effluents carry with them or incorporate harmful substances above the maximum permissible levels, or that these substances produce adverse effects on the receiving means due to their lengthy permanence therein.

A titleholder who resolves to exploit mining resources must submit to the Ministry of Energy and Mines an Environmental Impact Assessment (EIA), contemplating all potential environmental impacts originating from the investment project. Titleholders may enter into environmental administrative stability with the Ministry, based on the approved EIA or Environmental Adjustment and Management Program (PAMA), in which the following will be established:

- The term for the adjustment,
- The monitoring program,
- The permissible levels of the effluents as of the date of
- The signing of the contract.

Formerly, as it has been previously stated, there were no legal requirements regarding mine closure for the mining operators. This has changed, and for the new projects it is required to include as part of the environmental impact assessment, EIA, a closing plan that identifies the problems, the focus, the objectives and the costs of the closing. Gordillo states that the "acid drainage is a problem that all the mining industry faces. In Peru this is of particular importance, being necessary the appropriate characterization of mine rock and of waste material to incorporate inside the design of mine closure appropriate measures for the prevention of the generation of acid water."[67]

[65] Legislative Decree No. 613, dated September 1990.
[66] Supreme Decree No. 016-93-EM, dated April 28, 1993.

[67] Gordillo, Rocío. Environmental Policy in Peru and Legislation on Mine Closure. Primeras Jornadas Iberoamericanas de cierre de Minas, La Rábida, Huelva, España, 2000.

On the same token, in July, 1995, a "guide of limits was published for considerations of closing of mining operations that describes the design mine closure like an specific activity for each deposit and which should take into account the climate, the hydrogeology the sensibility of the environment and the final use that the land will be given once to the mining activities have concluded."[68]

Recently, the Ministry of Energy and Mines has published an environmental guide for the Closing and Abandonment of Mines that considers the following:

- Protection of the life and the population's health located in the influence area.
- Prevention of the environmental deterioration, avoiding negative impacts in courses of water, air and floors.
- Reclamation of the disturbed area trying as much as possible to return to their original conditions and in case it cannot be this possible, to give them an use so that it will be useful for the population of the area.[69]

2.2 Administrative responsibility and government capacity

In this chapter, it will be analysed the administrative responsibility for mining and the environment and mine closure, establishing what is it usually and trying to determine whether there is any advantages of one system over another. A few words will also be devoted to government capacity.[70]

The responsibility for the technical and safety aspects of mine closure must be with the mining company working to the regulatory requirement or agreement of the government. Ideally the social and community responsibilities should be the government however the mining company can provide assistance or facilitate a consultative process with stakeholders. A good example of community consultation is the Wallaby Project at Granny Smith, Western Australia.

At the end of the day, the ultimate responsibility for identifying and addressing the risks (both operational and residual) lies with the mining company. However, certainty in environmental issues is rare, and governments must define the level of risk that they are willing to accept at closure, in order for the mining company to work towards that. Cannot

[68] Gordillo, Rocío. Environmental Policy in Peru and Legislation on Mine Closure. Primeras Jornadas Iberoamericanas de cierre de Minas, La Rábida, Huelva, España, 2000.

[69] Gordillo, Rocío. Environmental Policy in Peru and Legislation on Mine Closure. Primeras Jornadas Iberoamericanas de cierre de Minas, La Rábida, Huelva, España, 2000.

[70] Building capacity to implement new policies in government and industry has been a major activity for UNEP. The work includes making information available to a wide range of professions, preparing trainers manuals, stimulating the upgrading of training curricula in institutions, and holding training workshops. In 1998, UNEP produced a training manual on Mine Rehabilitation for Environment and Health Protection. The manual is designed as an applied, hands-on guide to address the rehabilitation of disturbed land, particularly as it applies to mining lands. It is a practical, factual method whereby rehabilitation techiniques can be applied. Hoskin, Wanda. Mine Closure: The 21st century Approach. In Primeras Jornadas Iberoamericanas de Cierre de Minas, La Rábida, Huelva, España, 2000.

have a non-fixed goal-post. NGOs and communities are responsible for helping to define what level of risk is acceptable.

Government needs to set a clear legislative and fiscal framework. The initial licensing procedures and requirements can be used to initiate the process of mine closure planning and community consultation.

To the extent that local/provincial government can successfully integrate a mining project into the regional development plan, this can help reduce the dependency of the region on the mine and can create a context for planning and delivering social services (e.g. health and education) by government rather than by the mine. [71]

The question here is to determine what are good alternatives when government capacity does not exist?

Regarding alternatives of responsibility when government capacity does not exist or is not sufficient, it is important to consider that at the end of the day when the mining company no longer exists the government or community will be left with whatever legacy is left behind. To attempt to deal with this mining companies can establish Foundations to address community and social issues and the Foundation can be structured so that it exists for a period of time after mine life. A role that the Foundation can play is to work with the government to assist the government to develop the capacity that it lacks.[72]

In parallel, it could be used "accredited" auditors or technical specialists to assess residual risks. Is currently a business model whereby a company assumes responsibility for closure liability, and is paid for doing so by the mine.

For new mines, responsibility for mine closure and reclamation should be taken by the entity that will make a profit from the activity. Considering the case of pre-existing or pre-law mines it is a much more difficult question, since part of the wealth that the mine helped create has already been shared by the society and/or country surrounding the mine in the form of jobs or created infrastructure. Furthermore, sometimes it is hard to find the responsible entity (corporation, former government, people that have passed on or are beyond reach in some way). In this case, it would be fairer to spread out the cost of ameliorating the most difficult problems among parties that would benefit the most from the solutions to the problems.

For example, in the case of a water contamination problem, the government agency with enabling legislation should take the lead and use other agencies most familiar with the problem to help reach an equitable solution. Those that stand to benefit from the solution (agricultural interests, cities or districts that must supply clean drinking water supplies, tourism interests, etc.) should participate in planning and cost sharing to implement the solution.

[71] Strongman 2000.

[72] Kennedy, Mike 2001.

2.2.1 South Africa

In South Africa, liability on mine closure is transferred to the State. In the event that the accumulated funds are inadequate for mine rehabilitation, State Agencies may choose to curtail the rehabilitation process or make up the shortfall from treasury funds. The majority of mining companies in South Africa have centralized the closure funds at a corporate level and these contributions are tax deductible as running costs. According to Mary Stewart and Jim Petrie, the practice and experience with remediation bonds has not evolved "to a level where there is clarity over or consistent application of the concept."[73]

In South Africa there is a Standing Committee on Environmental Management for the Mining Industry. This committee is chaired by the Department of Minerals and Energy, DME, and includes representatives of the mining industry (Chamber plus others), government departments such as the Department of Environmental Affairs and Tourism, DEAT, (national and provincial), Department of Water Affairs (DWAF), Finance, South African revenue services, Agriculture. Organized agriculture and the labor unions are also represented on the committee. The Committee's function is to serve as a forum for the different stakeholders in mining. Roles of the Committee include communication, debate issues, can make recommendations to change policy through negotiations.

This structure does work reasonably well. It was responsible for the preparation of the Aide Memoir (Guidance on EMP Reports) and the finalization of the accepted arrangements regarding financial provision for closure. Because it is a working committee it is executive and dynamic, therefore it does get things done.

Regarding availability or government resources for administration, inspection and auditing, the overall conclusion is that governments lack sufficient funds to deal with this issue, at least in the non-developed countries. In South Africa, for example, there is very little capacity across all of the government departments. There are cases where the approvals of Environmental Management Programme, EMP, and applications have been delayed for up to 5 years. The problems with concurrent jurisdiction of the various government departments, and their differing requirements also delay processes

2.2.2 Australia

In Australia, liability for environmental protection during the operational phase of mining lies with the leaseholder or landowner in most cases. At the time of closure, the mining lease is relinquished or extinguished and the landowner[74] resumes liability. Each State has specific rules though:[75]

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[73] Stewart, Mary and Jim Petrie. Planning for Waste Management and Disposal in Mineral Processing: A Life Cycle Perspective. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999. Page 167.

[74] Either State or private.

[75] The following table has been made by Clark. See Clark, Ian. Planning for Closure: The Case of Australia. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999. Page 447.

- Tasmania: Crown is liable after the discharge of corporate liability with the discharge of lease and closeout.
- South Australia: Landowner is responsible, unless another arrangement has been agreed at closeout.
- Western Australia: Land titleholder or the Crown.
- Queensland: Liability is with the landowner, but a mining company may be held liable under the Conservation Act if subsequent problems arise.
- New South Wales: in the case of coal, the mining leaseholder remains liable. In the case of minerals, the landowner is liable.
- Victoria: Liability rests with landowner, but the mining company can be prosecuted if problems related to mining arise and additional cleanup is required.
- Northern Territories: Once the mining company has quit the site, liability rests with the land titleholder.

In front of this diversity, Clarks thinks, "it is possible that this is an area where some form of national regulation and consistency would be appropriate."[76] As an example, he suggests, "For each project there could be an agreed period of time post-mining after which liability passes to the Crown. The concern with returning liability to a private landowner is that some environmental problems may only become apparent some time after the closeout."[77]

2.2.3 United States

In the United States, closure is typically regulated at several levels: federal, state and county. The Bureau of Land Management (BLM) regulates mining and closure on public lands under its jurisdiction through the authority of the Federal Land Management Act (FLMPA) of 1976. Prior to enactment of FLMPA, the BLM did not have the authority to regulate mining or require closure for those minerals commodities subject to location by a mining claim (gold, silver, copper). Therefore, enactment of FLMPA is one example of enabling legislation that improved closure practice on public lands.

In the United States, operators are held responsible for reclamation and closure of their operations. The operator obtains a variety of permits from federal, state and local agencies. Requirements for closure and reclamation are made a responsibility of the operator by including them in the permit or by making them a condition of approval of their activities. The Bureau of Land Management, for example, requires an operator to file a plan of operations and reclamation plan for proposed mining activities on public land. The Bureau of Land Management then prepares an environmental document to analyze the proposed activities and potential impacts. Bureau of Land Management's approval of the operator's

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[76] Clark, op. cit. page 447.

[77] Clark, op. cit. page 447. Calrk also thinks that it would be unrealistic for the landowner to be expected to assume responsibility for the costs of any required reclamation, especially as they could be substantial.

plan is subject to the inclusion of mitigating measures into the operator's reclamation plan to minimize or avoid potential impacts as identified by the environmental document.[78]

If government capacity does not exist, options are severely limited. Perhaps the best alternative at that point would be to work on passing laws that would assure that future mining would involve some sort of reclamation. Additionally, future mining could involve some sort of severance tax arrangement with the moneys earmarked for safeguarding and eventual reclamation of old mines.

If government capacity is not sufficient and cannot be increased sufficiently then the government must make some decisions on priorities of what to protect first. The risk receptors in surrounding areas must be identified and assessed as to danger and economic effects of the mining activity on those activities. Whatever process followed would work best if it were public and transparent. The process should be limited to very specific issues identified as top priority items.

In the United States, one way to deal with limited government resources is to contract services from private, third parties or consultants to undertake the sometimes specialized or needed work. In these situations, the mining operator is responsible for paying the third-party or consultant while the government entity is responsible for providing the overall management and guidance to the third-party.[79]

In the United States, a National approach has the advantage of providing consistency over a broad area while a State or local government could perhaps better craft a program which better meets the needs of the local area. The Clean Water Act is an example of a National law to regulate water quality, which however can be administered by the individual States if they choose to.

There are other questions that should be considered in conjunction with the one of trying to determine which administrative structure works best regarding mine closure: National or State agencies? One of these questions is how varied are the conditions where the mines exist? Another one is what type of organization does the government of the country involved have? Then one can determine where the best place to administer mine closure is. In the case of the United States, it turns out that the country is so varied in climate, topography, soils, and geology (among other factors) that the best place to administer mine closure has turned out to be at the state level. Generally, however, this has only been very effective in states that have had a history of mining and also have other competing industries such as agriculture and tourism. In other countries this may not be the case.

[78] Bureau of Land Management, 2001.

[79] Bureau of Land Management, 2001.

2.2.4 Papua New Guinea

Misima Mine[80] is proceeding smoothly – environmental damage limited[81] and rehabilitation is going well. Workforce union has entered a joint venture with a commercial recruitment agency in an attempt to find jobs for workforce. 80%+ of workforce was local – unusually high in PNG (cf Porgera 50%, Ok Tedi 30%). Redundancy package is oversubscribed and Trust Funds for landowners (worth about US$4m) are in place as is a villager-designed trust investment scheme. But it is too soon to say if the ultimate result will be successful. Closure at Bougainville[82] was close to catastrophic. The other closures involve projects rather small.[83]

Most projects are in, for geological reasons, remote locations where government influence is recently introduced and usually very weak. This is important since, according to Richard Jackson, a strong local government is vital to a successful closure process. However, capacity at different levels is also a problem.

According to Richard Jackson, at the national level Department of Mining staff have generally done a very good job but many other agencies have done very little or even been obstructionist. National government is weak and has great difficulty in making any national policy stick with local people – especially if the locals don't agree with it – as is often the case in mining. For example, I hardly know of any Papua New Guinean who doesn't think all minerals on his land belong to him – even if the Law states that all minerals other than alluvial belong to the State.[84]

At the Provincial (regional) level, the situation varies according to different factors regarding the quality of government agencies. Misima had an efficient and responsible Provincial Government to work with. The Western Provincial Government[85] has been accused of corruption.[86] The Lihir project is hosted by the Provincial Government of New Ireland, well regarded by all actors.[87]

At the local level, the vital one, according to Richard Jackson, local government is hardly noticeable at Ok Tedi, quite good at Misima, good at Porgera (it receives 5% of royalties- at Ok Tedi and Misima LGs receive nothing) and at Lihir has the potential to be excellent (it receives 30% of royalties) but these are early days at Lihir yet.[88]

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[80] Misima Mine, gold, 3.3moz produced, mining now ceased, milling of low grade ores will continue for three years. Workforce reduced by 60% in 2001. Detailed, agreed closure plan in place.

[81] A deep sea tailing scheme is in place.

[82] Bougainville Copper – a very large copper producer closed in 1989 by the outbreak of violence against both the mine and PNG by the Bougainville Revolutionary Army that sought independent statehood for Bougainville. It happened more or less overnight with no planning and most workers found employment elsewhere (it was a boon for the Porgera gold project). It would be most interesting to research the effects of this drastic closure – especially environmental issues.

[83] Jackson, Richard, 2001.

[84] Jackson, Richard, 2001.

[85] In which Ok Tedi is located.

[86] It has been suspended on several occasions for malfeasance of funds.

[87] Jackson, Richard, 2001.

[88] Jackson, Richard, 2001.

Regarding responsibility, national government has made strong efforts to develop closure policy but this process is currently moving slowly. Nevertheless, the points made in the draft mine closure policy will probably be asserted as 'effective policy' by government officers in closure negotiations. Those points do strongly favour local participation in closure. For the past two decades responsibility for any sort of development in mining areas has tended to fall, by default, into the lap of the mining company – no one else has shown the capacity or willingness to do anything. This does not bode well for closure – but successful closure must mean that local level government is ready, willing and able to carry on with whatever legacy is left by mining. Thus, strengthening local government is a key priority in all mine closure planning in PNG at present – we will have to wait to see if it has any success.[89]

2.2.5 Japan

In Japan, the regulatory authority depends of the law regulating a specific mine closure issue. Within this context, the Director of METI is the regulatory authority regarding any mine closure norm emanating from the Mining Law. The Director of Mine Safety Inspection Department is the regulatory authority regarding any mine closure norm emanating from the Mine Safety Law and the Special Law.

Regarding the question whether the regulatory authority is a separate group of part of another group, the Mine Safety Law is a special law whose scope of application is restricted to the mining activity only. Regarding, wider environmental regulations, a prefectural governor has the authority to regulate mine pollution. Environmental regulation standards from the Mine Safety Law are similar than those from more general laws.

Regarding the question whether regulations are prescriptive or performance based, most of the standards are prescribed under mine pollution prevention technology, but some are performance based under the target standard that will be able to be achieved in the near future.[90]

In Japan, there is no set of standards for rehabilitation. The Mine Safety law requires a number of obligations from the mining right holder, but rehabilitation is not among the objectives of the law. Not existing a set of standards for rehabilitation there is no place for exemptions.[91]

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[89] Jackson, Richard, 2001.

[90] By requesting ideas from related ministries, the opinion of interested parties will be reflected in setting standards. Generally, Ministry of Environment and Ministry of Social Welfare will be stricter on standards than Ministry of Economy, Trade and Industry (METI). The later always keep in mind to avoid hindrance of economic activities.

[91] It is assumed that most cases of rehabilitation are impossible. Rehabilitation would be regulated according to Civil Law, and decided under a voluntary basis between the landowner and the holder of the mining right. Certainly, all this dies not prevent that the titleholder takes voluntary measures directed to achieve rehabilitation.

Regarding the question whether the law refers to the closure of disturbance as a result of exploration, in Japan there is no law referring to the closure of disturbance as a result of exploration. Except for Metal Mining Agency of Japan, MMAJ, drilling survey, all drilling survey activities and exploration activities on surface or underground in mining areas are referred as "mining". If the mining right lapses after completing only exploration, it can be referred as "mine closure". If mine pollution prevention is necessary, some measures are taken based on the Mine Safety Law.

Prevention of accumulated mine pollution is the object of Special measures, and apply to development of gold, silver, copper, lead, zinc, arsenic and sulfur mines. But is does not apply to non-metal, coal, and petroleum operations. The Mining Law and the Mine Safety Law are equally applied despite the scale of development and company. There is some difference based on the scale of facility in mine pollution prevention regulation.

Regarding the question whether the law requires a closure plan to be prepared, in Japan the law does not require preparation and submission of a mine closure plan. However, as an "administrative guidance", it is necessary to submit a closure plan from the viewpoint of prevention of danger and mine pollution. It does not include economic and social measures related to the local community.[92]

Administrative guidance, regarding to the submission of the mine closure plan, becomes necessary when the closing of the mines appears clearly. The Special measures Law specifies construction plan for each specific facility. The Mine safety law requires approval of the Inspector for the construction of works and facilities each time it is required, but does not have specific requirements for mine closure. If the holder of the mining right plans complete mine closure, the mine closure plan will be organized and conducted based on the system required by the inspector. The Inspection Department inspects the conducted works.

Regarding the question whether the law distinguishes when the closure plan must be ready, in Japan, generally, in proceeding with mine closure, Japanese mining companies end mining operations gradually by streamlining operations and workers. The mining company has to submit the mine closure plan when the closing of the mine becomes clear.[93] Regarding revisions to the mine closure plan during the mine life, the Special law requires submitting of construction plan and report on it regularly. On the same token, the Special Law requires submission of the plan once a year and report after taking measures.[94] There are no specific requirements to the mine closure plan.[95]

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[92] The Inspection Director requires submission of the Mine Closure Plan when the company's mine closure plan is announced. The Special Measures requires preparation for funding regarding the proposed measures.

[93] For facilities already started, the Special Law applies even before the date of the enactment of the law. For facilities built after the enactment of the law, the law will be applied from the starting point of the project.

[94] It is required in the month of July.

[95] The Inspector guides the holder of the mining right's plan to satisfy regulation standards. It includes the future operation plan and mine closure measures and works plan but the following is

Regarding whether is required a notice of change of project status, in Japan inspection will be reviewed if there is a change in the mine closure project. If there is a major change in the mine development plan, the plan needs a new approval. If there is a change in the construction plan under the Special Law, cost estimate will be projected on the newest measure plan, and reserve funds.[96]

Within the Japanese legal system there are no requirement of re-vegetation. On the other hand, re-vegetation is one of the possible mine pollution prevention measures, such as stabilization of surface of the tailing dam.

Law does not require impact assessment for mine closure. Some impact assessment will be required for the further development of new land exceeding standard scale and national forest area under the regulation of local governments.

On the issue of what approval is necessary for closure plan to be accepted, in Japan the plan should be submitted to the Director of the Inspection department. The plan, including the maintenance of related standards to mine pollution and prevention measures should be submitted and approved. However, laws and regulations do not specify all this.[97]

Law does not require public notice of the plan and its approval. However, if required, those documents should be made public.

Regarding prevention of danger or mine pollution after mine closure in Japan, the national government, the local government, and obliged owner, play each a role and responsibility based on legislation and mine pollution prevention policy. In case the obliged owner is not able to take responsibility, various measures are taking during operation and the government provides measures to secure necessary funds after mine closure by a subsidy system, financing system of the metal Mining Agency of Japan (MMAJ), and reserve fund system before mine closure (during operation).

In Japan, Polluter Pays Principle (PPP) is applied to the mine pollution situation during operation and after mine closure. In order to take drastic measures to deal with mine pollution, based on use of environmental resources, securing justice, and PPP, the

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not included necessarily: Information on uses of the land and water adjacent to site; names of owners, occupants and other proponents of land on site.

[96] Closing pits will be necessary for the prevention of danger. Maintenance of pits with mine water will be required. A prevention measure for collapsing of remaining walls after operations is required for the prevention of danger. There are no individual open-pit mines in Japan. Those existing open-pit mines are part of a bigger complex that includes underground mines. Also, treatment of mine drainage and prevention measures for collapsing due to storms and earthquakes. Treatment of mine drainage is required. Measures will be necessary if there is impact on the treatment. Measures will also be necessary if the seepage from the mine drainage and tailing dam have impacts. Measures will also be necessary if mine pollution prevention is required for leaching. It should be considered that there are no individual leaching mines in Japan. If there is danger of mine pollution by the collapse of a tailing dam, and damage to the surface caused by an unpredictable earthquake or a heavy storm, and there is an accident of falling down at the operation area, mine pollution prevention measures are required.

[97] There is no specific length of time to get the plan approved. However, the general law does have certain requirement of time regarding the processing of public documents.

government clarified the extent of responsible costs and responsibility of polluter, and promoted a legal and inspection system for mine pollution prevention policy.

In the event that there is no obliged owner (company) for preventing mine pollution such as discharging of mine waste water and collapsing of tailing dam, the national government, local government and the company (that currently operates the mine or the last one in that case) should conduct mine pollution prevention works together. As a result of the proper application of this system, currently, serious and large-scale mine pollution does no longer exist.[98]

Now, regarding the issue of which administrative structure works best regarding mine closure, in Japan it is possible to state that both, national and local governments have their own responsibilities and duties and the interaction of both, taking appropriate measures regarding mine closure, ensure a successful system.

2.2.6 Brazil

Environmental impact Assessment, EIA, is the instrument of previous control of projects which can cause damage to the environment, aiming at avoiding pollution or, at least, minimizing it by means of mitigating or alternative measures (CONAMA Resolution no. 01 of 1986). The results of the EIA should be presented in the Environmental Impact Report (EIR), which evaluates alternatives for the project's technology and chosen site and includes aspects related to the construction and operation of the enterprise to be licensed.

Act 97.632 (April/89) establishes that during the EIA/EIR process, the mining entrepreneur should submit a mine reclamation plan to the approval of the environmental agency. It considers that the recovery should return the degraded land to its former condition in agreement with a preset plan for the use of the soil, in order to reach the stability of the environment. The EIA/EIR usually include issues related to monitoring programs, the future land use and the physical and chemical stability of the rehabilitated areas, but a statutory requirement for a Closure Plan is not common.

Environmental licensing is the procedure by which the installation, amplification, modification and operation of enterprises that use natural resources or are potentially aggressive to the environment are licensed (Resolution CONAMA nº237/97).

In Minas Gerais, COPAM - State Council of Environmental Policy is responsible for environmental licensing. It operates through the specialized chambers, which are advised by the organs of the State Secretary of Environment - SEMAD. The operation license is granted by means of approval of an environmental control plan. For the mining projects this plan contemplates the several stages of the enterprise, and it also establishes the conditions, restrictions and measures of environmental control that should be obeyed. In the environmental licensing process, the decision about the need of elaboration of a closure plan is in charge of the technicians of SEMAD and of members of the Mining Activities Chamber. The Forest Act of the State of Minas Gerais highlights the mining activities,

[98] Uematsu, 2001.

considering that licensing for mining will depend on the approval of a technical project for flora rehabilitation with local or regional native essences in addition to the project for soil rehabilitation.[99]

In Brazil, the company can be considered responsible for the environmental impact associated to its activities even if this impact is caused after its closure. Sometimes this responsibility is defined in a very general way, causing a high degree of uncertainty according to the chosen approach of responsibility (CASTRO, 1996):

- Strict Responsibility: responsibility for causing damages even if the activity of the company is considered legal and cautious.
- Common Responsibility: a company can be made responsible for all environmental problems on its area of influence, even if this company is only partially responsible for the damage. This approach can discourage the retaking of the abandoned mines by other companies, even if this is the most acceptable way of achieving the rehabilitation of the area.
- Retroactive Responsibility: responsibility for damages caused previously to the Act or any specific regulations. It usually implies high costs to define who should take the responsibility. It is estimated that 1/3 of the money collected by the Superfund in the United States has been spent in this activity.

In some cases this situation can lead companies to go beyond the commitments with the legislation, but usually these approaches are criticized for being unfair and for discouraging investments in mining activities.

The retroactive effect of the Canadian legislation demanding financial assurances for on-going mines took into consideration the need of a period of transition for the adaptation of the new demands. It is recognized that up-front funding, mainly in cash, would represent a strong limitation for new investments (REID, 1994).

The system of financial assurances should give the entrepreneur the possibility of the best choice regarding the technical solution for environmental recovery.

Therefore, the flexibility of this instrument should exist in the conception of the project, in the modality of financial assurance to be adopted and in the definition of responsibilities.

[99] Resolution of CONAMA-02/96 (April/1996) determines that the enterprises projects which can cause damage to the environment should implant any modality of Conservation Unit of public domain to compensate for the environmental damages caused by the destruction of forests and other ecosystems. This compensation can be turned into the costing of activities or acquisitions of goods for the already existent Conservation Unit or for the creation of a new one. It also establishes that the amount of the resources to be used for these compensations cannot be lower than 0,5% (half percent) of the total costs for the implantation of the project. The Forest Act of the State of Minas Gerais establishes the obligation of the implantation of forestry and reforestation projects to make up for the occupation of superficial areas for mining.

3. Legal and Institutional Framework

It seems to be a fact that, overall, only a very few nations and/or their individual provinces/states, have enacted and implemented actual mine closure laws e.g. the United Kingdom, the Province of Ontario and the state of Nevada, United States of America In most nations mine closure requirements occur either within the mining law, and its associated Implementing Rules and Regulations (IRR's) , or within specific environmental legislation that is applicable to the mining sector. In the latter case the requirement is that an Environmental Impact Assessment (EIA) or Environmental Impact Study (EIS) be prepared for development projects that are anticipated to have a large environmental impact.[100]

Key drivers of mine closure practice are legislation and the ability of the authority to implement legislation. The process of closure and the release of company responsibility of a site are driven by legislative requirements. These issues are addressed differently in various countries and examples will be discussed to highlight mine closure practices, which minimize post closure risks and impacts. [101]

Regarding the question of how do countries implement mine closure regulations and where has legislation improved closure practice, in the case of Papua New Guinea closure regulations can best be attached to mining and/or environmental legislation. In PNG industry best practice is leading the way. Government regulations/policy still need to be established so that the rules for new mining development are clearly understood by intending investors.

In the case of South Africa, some analysts from the private sector consider that although closure policy and legislation is reasonably clear, the interpretation of it has been quite subjective by the Departments. Recent "tightening" of the interpretation has thus led to difficulties where mining companies have no history on which to base their approach, as previous requirements have been less stringent, or applied differently (specifically the financial provision issues). Legislation certainly has the potential to improve closure practice, such as the EIA regulations, the performance assessment and monitoring regulations and such. However, lack of consistent application and enforcement detracts from their effectiveness.

A special issue for regulatory agencies is presented by the temporary closure of mines. The length of time before full closure should be implemented, the amount of pressure that can or should be exerted on mine owners to declare bankruptcy and the ability of the authority to deal with abandoned mines need to be addressed. Different national regulatory responses to temporary closure will be reviewed. [102]

[100] Clark 2000.
[101] Working paper on mine closure, LVW Workshop 2001.
[102] Working paper on mine closure, LVW Workshop 2001.

3.1 Landscape

Reclamation and closure typically requires that the reconstructed surface blend and mimic the natural surrounding topography. The suggested rule here from a policy perspective is the return as possible to agreed geotechnically stable land form.

In Japan, according to local government, environmental impact assessment is regulated in large-scale mining development. Some of the aspects of this EIA (environmental impact assessment) include the protection of landscape after mine closure.

3.2 Water quality

The general rule under this subject would be to comply with agreed criteria outlined in closure plan or legislation compliance.[103] Some authors, like Strongman, state that a generally accepted guiding principle is avoiding mining and waste disposal methods that will have impacts on water quality for generations to come. He illustrates with the following examples:[104]

- Acid rock drainage impacts can last a century or more e.g Equity silver mine in Canada
- Releasing toxic material into the community e.g. Super Fund clean up of lead mines in USA
- Riverine disposal of very large mine wastes e.g. OK Tedi mine in Papua New Guinea

There have been great strides in scientific, environmental and health knowledge over the past century and many past practices are now recognized as potentially very harmful. In particular, acid rock drainage is now recognized as having harmful environmental effects for many decades and beyond if left unchecked.

Toxic materials including base metals can prove a serious human health threat if not properly handled and cleaned up. Recent studies show that some waste disposal methods may have consequences for many decades to come best practice is to avoid these mining and waste disposal methods.[105]

In South Africa, the National Water Act is enabling legislation that contains wide provisions particularly relating to responsibility for the integrity of water resources. Duties are imposed

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[103] According to Mudder and Harvey (1999), "The single most important issue which directly affects all other aspects of closure is water management. Often a mining operation, and in particular an open-pit heap leach facility, can operate with a *zero* water balance due to evaporation and the wetting of ore. As a result, there is initially no need for a discharge permit and a major regulatory issue is circumvented. But as decommissioning and closure approach, the site water balance remains as before, but the entire water management system is replaced by the need to eliminate large stored inventories. A common misconception regarding the mine site water balance stems from the belief that water management is automatically successful if annual evaporation exceeds precipitation."

[104] Strongman 2000.

[105] Strongman 2000.

on persons whose activities may cause pollution to take measures to ensure water resources are not impacted upon. Failure to do so results in liability under the Act. These provisions have retrospective application and would apply to any mine owner both during and after closure of a mine to ensure the necessary measures are taken.

In the United States, standards are set by the CWA for surface waters. The States set parameters for groundwater.

In the United States, specifically in the State of California, in the case of both new and existing mining waste management units must undergo closure "so that they no longer pose a threat to water quality." In their classical study,[106] McElfish, Bernstein, Bass & Sheldon state that closure requirements are prescribed in the operation's closure and post closure plan, which must be approved by the regional board. This plan must "incorporate" the SMARA[107] reclamation plan.

In the same line, closed units must be provided with at least two permanent monuments installed by a licensed land surveyor or registered civil engineer. The post closure maintenance period ends only when the regional board determines that water quality aspects of reclamation are complete and waste no longer poses a threat to water quality. The aforementioned authors underlie that "no specific time period is identifies in the law or regulations. No post mining land uses are permitted that might impair the integrity of containment structures. Revegetation may not impair the integrity of containment structures, nor may the irrigation of vegetation cause or increase the production of leachate."[108]

Also, in the United States, the California State Mining and Geology Board's Financial Assurance Guidelines provides rules regarding water quality. Homestake has recently followed these rules in the mine closure of the McLaughlin Mine. In this case, in addition to providing funds for reclamation, the Financial Assurance also provides funds for "cleanup and abatement" by the Regional Water Quality Control Board in the event cleanup or abatement should be required either before or after completion of reclamation. The provisions for such cleanup and abatement funding continue in effect until the Regional Water Quality Control Board "determines that it is no longer necessary to retain funds for such purpose." The provisions for such cleanup and abatement funding satisfy the requirements of the Water Quality Control Board for a "Pollution Release Bond."[109]

In Colorado, under the norms of the Water Quality Control Act, discharge permits issued for exploratory and mining activity may be inactivated when mining has ceased. Now, in case of exploration operations, the permit may be inactivated after termination of activities if the effluent loading, without treatment, can be shown to be statistically similar to the historic mass loading, even if it violates applicable water quality standards. McElfish et. al.,

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[106] McElfish Jr.; James M., Bernstein, Tobie; Bass, Susan and Elizabeth Sheldon. Mining: State Approaches to Environmental Protection. Environmental Law Institute. Washington D.C. 1996.
[107] Surface Mining and Reclamation Act.
[108] McElfish Jr.; James M., Bernstein, Tobie; Bass, Susan and Elizabeth Sheldon. Mining: State Approaches to Environmental Protection. Environmental Law Institute. Washington D.C. 1996.
[109] Homestake Mining Company, McLaughlin Mine. Closure Plan. July 16, 2001. Page 37.

state that "this statistical similarity must be demonstrated on the basis of a specified test of a minimum of three samples and concurrent flow measurements taken at least 30 days apart."[110]

In Nevada, State regulations distinguish between temporary and permanent closure and between planned and unplanned temporary closures. The water pollution control permit regulates the closure of process components such as ponds, heaps, tailing impoundments, mills, and spent ore dumps. A temporary closure means the cessation of the operation of a process component for more than 30 days with the intention of restarting it. The case of "planned temporary closures include cessation of operations on a seasonal basis because of normal weather cycles, and interruption in the beneficiation process to provide periods of quiescence for metallurgical or operating reasons."[111]

In Japan, water quality is an issue regulated by the Mine Safety Law and the Prevention of Water Quality Pollution Law.

3.3 Biological and ecological resources

In this part the issues of biodiversity will be analyzed. Biological and ecological resources should be considered as part of normal rehabilitation program and dependent upon agreed mine closure options.

Morrey (1999) states that it is likely that the least understood and often-neglected issue in closure planning is that of site reclamation for land-use development. In the context of land reclamation for ecological purposes, the restoration of pre-mining conditions may be technically and economically difficult. As a general rule, the biological stability of reclaimed land, including vegetated mine waste, increase with species diversity and habitat diversity. Long-term sustainability also depends upon the establishment of microbiological processes within the rooting zone. In this way, the approach to successful rehabilitation should be holistic, and aimed at habitat reconstruction, soil development, and ecosystem restoration, rather than vegetation establishment alone. Morrey defines this as a process of short term management and long term natural succession.

In the United States, facilities must be designed to protect and conserve biological resources. Cumulative impacts must be considered with respect to the entire ecosystem. Sensitive resources are of special of concern, especially, those that have been listed as threatened or endangered; special measures must be undertaken as necessary to protect existing populations and critical habitat.[112]

In the State of Arizona, Revegetation Standards are established in the Mined Land Reclamation Act, MLRA:[113]

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[110] McElfish Jr.; James M., Bernstein, Tobie; Bass, Susan and Elizabeth Sheldon. Mining: State Approaches to Environmental Protection. Environmental Law Institute. Washington D.C. 1996.

[111] Op. cit.

[112] Bureau of Land Management, 2001.

[113] Mined Land Reclamation Act, MLRA, Title 11, Chapter 2, R11-2-702.

1. Where surface disturbances result in compaction of the soil, ripping, disking, or other means shall be used in areas to be revegetated to reduce compaction and to establish a suitable root zone in preparation for planting.
2. Revegetation shall be conducted to establish plant species that will support the approved post- mining land use. The establishment of vegetation species, density, or diversity which is different than pre-existing conditions or on adjacent lands shall constitute successful reclamation if any of the following apply:
    - The post-mining land use is different than the pre-mining land use or the use of the adjacent lands;
    - The site-specific nature of the surface disturbance, including soil conditions and topography, is such that the establishment of pre-existing or adjacent conditions is not technically or economically practicable; or
    - The establishment of different species is preferable for control of erosion.
3. Planting shall be conducted during the most favorable period of the year for plant establishment.
4. Soil stabilizing practices or irrigation measures, or both, may be used to establish vegetation.[114]

In Japan, according to local government, environmental impact assessment is regulated in large-scale mining development. Some of the aspects of this EIA (environmental impact assessment) include the protection of biological and ecological resources after mine closure.

3.4 Land use

Land use, and specifically, post use of land is a critical aspect of mine closure policy. In effect, "Mining is a relatively short term land use; therefore, it is important that disturbed lands are returned to a safe, stable and productive post mining land form that is both suitable and acceptable to the local community." [115]

It appears that a safe rule on this subject would be to consider land use as agreed with governments and communities.

David Morrey points out that current trend in closure planning "advocate assessment of land capability and end-use at an early stage in project development and reclamation design."[116] In this way, it is recommended the following when planning the reclamation of mined land with particular end-uses in mind:[117]

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[114] Martin, Douglas K. (Arizona State Mine Inspector) Mined Land Reclamation Statutes and Rules. Division of Mined Land Reclamation, Arizona, January 1997, page 47.

[115] Sassoon 1996.

[116] Morrey, David R. Integrated Planning for Economic Environmental Management During Mining Operations and Mine Closure. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999.Page 248.

[117] The following examples are cited by Morrey, op. cit.

- Application of guidelines.[118]
- Reference to national systems and criteria.[119]
- International Guidelines.[120]

In the United States, Land Use Plans are prepared for all public lands. Uses of these lands by facilities such as mining operations must conform with the land use plan and its stipulations on particular uses of the land.[121]

3.4.1 Japan

Japan has established an interesting concept denominated Eco-Town. The Ministry of International Trade and Industry, MITI,[122] established an Eco-Town concept in 1997 and in November 1999 two Eco-Town plans were approved, for Uguisuzawa-cho (Migiyaki prefecture) in Northeastern Honshu and another in northern Akita prefecture (Northwestern Honshu).

Uguisuzawa is using the old Hosokura mine site, closed in 1987, as a Recycle Mine Park Concept Region. It is capitalizing on the mining technology and know-how of the region, and seeking to control waste generation and make effective use of energy to create prosperity in harmony with the environment. It is building facilities to recycle metal from household electrical appliances and other items, using the facilities and structures left by the mining operations. To do this it needs to heighten environmental awareness of the community, make information available and facilitate access to recycling facilities.

3.4.2 Papua New Guinea

In Papua New Guinea, the final outcome of the rehabilitation program is to achieve the planned land use(s) for all areas of the mining project. Detailed consideration for future use of each component of the project must be given to the regulatory authority[123] in the planning stage. The choice of the land use for each component will determine the actual rehabilitation procedures and will depend on various factors such as the nature of the

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[118] ICRCL, guidance on the Assessment and redevelopment of contaminated land, guidance Note 59/83, 2nd edition, UK. Interdepartmental Committee for the redevelopment of Contaminated land, department of the Environment, London 1983.

[119] An example from the United States: Klingbeal, A. A. and Montgomery, P. H., land capability Classification, U.S. Department of Agriculture Agricultural handbook N° 210, US Department of Agriculture, Washington DC, 1961. An example from the United Kingdom: Bibby, J. S., and MacKney, D., Land use capability classification, Soil Survey Technical Monograph N° 1, Her majesty Stationary Office, London, 1969.

[120] Riquier, J. A., A new System of Soil appraisals in terms of Actual and Potential Production. FAO, Rome, 1970.

[121] Bureau of Land Management, 2001.

[122] Currently, METI; Ministry of Economy, Trade and Industry.

[123] There is no specific regulatory authority for mine closure in PNG. However, during closure planning process, mining company sets up a closure team, which interacts with landowners, provincial government and Mining Department of the national government to plan out the closure phase. Main emphasis is given to the planting of cash crops, which can generate some income to the local communities after the mine closes.

overburden material, quality of the topsoil, conditions of the surrounding environment and conditions of the lease.

3.4.3 Canada

In Canada, the Ontario Ministry of Northern Development and Mines produced in 1992 a Policy Guideline entitled "Rehabilitation of Mines: Guidelines for Proponents." The guidelines set out principles, objectives and criteria for a mine closure and rehabilitation plan and identify three categories if rehabilitation in terms of the after-use of land that is sustainable in the long term:

- Walk-away status: there are no residual constraints on the future use of the land remaining after rehabilitation has been carried out and where there are no additional monitoring or maintenance requirements.
- Passive care: there is minimal need for monitoring and infrequent maintenance of non-critical structures.
- Active care: requires regular operations, monitoring and maintenance of the site that is not typical of normal land management practices. There may be permanent constraints on the beneficial use of the land, such as high metal concentrations.

The Guideline establishes that a site can only be considered properly rehabilitated if it has achieved a walk-away or passive care status.[124]

3.4.4 United States

In the United States, a recent example is the Homestake Mining Company McLaughlin Mine.[125] In this case, the proposal is the transition of the McLaughlin mine from a gold production facility to an environmental studies field research station. This proposal has been approved in the reclamation plan and it is well advanced. The first unit of the research station, named the Donald and Sylvia McLaughlin Natural Reserve, was dedicated in the spring of 1993. It is interesting to observe the high interest provoked by the proposal among researchers and universities. In the fiscal year 1999-2000, the Reserve attracted the participation of 28 faculty, 16 research scientists, three research assistants, 71 graduate students and 11 undergraduates for a total of 1538 on-site user days. Funding for on-site research in the same year totaled $2,070,000. [126]

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[124] Cited by Coppin and Box. Coppin, N. J. and J. Box. Sustainable rehabilitation and Revegetation: The Identification of After-Use Options for Mines and Quarries Using a land Suitability Classification Involving Nature Conservation. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999. page 231.

[125] Homestake Mining Company's McLaughlin mine, located in Napa, Lake and Yolo Counties, California, has been operating since 1985. Mining operations concluded in 1996. Milling operations are anticipated to cease by mid 2002. The mine's Reclamation Plan was approved by each of the Counties in 1983 and 1984 before the mine was put into production. The proposal is dated July 16, 2001.

[126] Homestake Mining Company, McLaughlin Mine. Closure Plan. 2001. Page 9.

3.5 Health and welfare

It seems that a basic rule would be that to the extent that the mining company has been providing these services to the community post closure alternatives need to be put in place.

A health risk analysis is a necessary component of the closure technology screening procedure if the significance of the environmental impacts of engineering failure, both during operations and beyond closure is a concern. The analysis may be quantitative or qualitative, and relies upon the questions of risk assessment: What can happen? How likely is it that it will happen? And if it does happen, what are the consequences? [127]

In the United States, the National Environmental Policy Act requires federal agencies to consider the affects of proposed activities in considering how best to protect the health and welfare of the human environment.[128]

In Japan, legislation applicable to mine closure does not include norms related to health and welfare.[129]

3.6 Social development and cultural changes

Social effects of mine closure, although often neglected, are often as adverse as the environmental and economic effects. In fact, in many countries in recent years, mine closures have exceeded new mine openings resulting in a significant number of workers being displaced. This situation is expected to continue in many countries including South Africa, Canada and China over the next decade. Hoskin reminds us that "with hundreds of thousands of workers displaced, consideration needs to be given to issues of income, skills training, worker mobility (although many workers do not want to move), physical, and mental well-being and alternative patterns of work. Mine closures represent a significant social and cultural upheaval as well as having financial implications for the country."[130]

Certainly, there are no easy answers to these challenges; but many companies are starting to discuss mine closure impacts with the community in advance of mine construction and operation. Among others, his is the case for the new copper zinc mine of "Compañía Minera Antamina" (CMA) in Peru. Antamina, a consortium of Rio Algom, Noranda, Tech and Misubishi Corp has discussed with the community elders what they would like to see left in their community after the mine operators remove their equipment. Even now, certain mine facilities are being designed and built with community after use in mind.[131]

Traditional social systems and cultural values greatly change as a result of mining projects bringing into local community's new way of life and changes. It is important, that

[127] Morrey, 1999.
[128] Bureau of Land Management, 2001.
[129] Uematsu, 2001.
[130] Hoskin, Wanda. Mine Closure: The 21st century Approach. In Primeras Jornadas Iberoamericanas de Cierre de Minas, La Rábida, Huelva, España, 2000.

[131] Hoskin, Wanda. Mine Closure: The 21st century Approach. In Primeras Jornadas Iberoamericanas de Cierre de Minas, La Rábida, Huelva, España, 2000.

traditional cultures and social aspects of local communities are identified and documented prior to the development of a mining project. This can be done using mechanisms such as Social Mapping for baseline investigations and documentation of the social systems and cultures before commencement of mining operations. Using tools such as this will assist in monitoring social and economic impacts and minimizing negative changes.[132]

Advance planning and close cooperation by the company with local authorities, communities and NGOs is a key to successful mine closure and achievement of post mine closure stability. Successful environmental closure can greatly help the social sustainability of the community in the post closure period – especially for farming communities. It is inevitable that the company will provide services to employees or to communities, so the company should make a concerted effort to help build local capacity to take over those services during the operational phase, not just at mine closure. An important question to consider for the company is who will be responsible to ensure the stability of any remaining de-commissioned assets (such as tailings impoundments) and who will operate any social of other infrastructure after closure when the mining company leaves.[133]

The inclusion of social issues in mine closure planning is a major component of the new proposed policy framework for Papua New Guinea. Existing Policy has been successful in integrating stakeholder interests into mine development through the "development forum process", a similar "mine closure forum process" is being considered to ensure that stakeholder interests are addressed at an appropriate time prior to mine closure.[134]

In the Ok Tedi case the mining venture brought development and opportunities to people who previously had no development or opportunities. When mining ceases the people will be left with levels of education, skills and sophistication that they previously did not have. The mining company will do what it can to assist the people to utilize those assets.

According to Richard Jackson, in PNG, the draft policy pays special attention to this. The draft has been circulated widely to interest groups and most attention has focused on social impacts – although NGOs tend to concentrate more on environmental issues. The simplest lever for sustainability to achieve is that of financial sustainability for landowners in Special Mining Lease areas – they receive reasonably large annual payments some of which have been invested for future use. Although inadequate[135] for post-closure needs, there remains the opportunity in the last years of other projects to make them adequate. Businesses built up during mining are almost universally far too dependent on the mine projects to survive closure. More problematic, much of the social infrastructure built up during operations will not be maintainable after closure. This is particularly so at Ok Tedi where a 'classic' isolated mining town has grown up. It is less of a problem at Porgera which operated a fly-in/fly-out (FIFO)operation for much of its life[136] and it is hardly a problem at Misima which also had both FIFO plus a very high proportion of local workers – who lived in their home villages.

[132] Hancock, 1999.
[133] Strongman 2000.
[134] Hancock, 1999.

[135] Except at Porgera and Lihir.
[136] And still does operate a partial FIFO operation.

Unfortunately almost all mine landowners[137] demanded[138] lots and lots of infrastructure – which, as closure approaches, is suddenly looking like a millstone to be worn around the communities' necks.[139]

How can social impacts be mitigated? Strongman 2000 suggests the following aspects:

- First, there is the provision of redundancy payments, re-training schemes and voluntary redundancy schemes. Advance payment of part of the redundancy package so that workers can purchase land in a phased manner can be very helpful. This could help avoid a large "land rush" driving up land prices if severance payments are all released at the same time. In such a case half a year or more of income may flood into the community at one time.
- Second, food security planning, agricultural training and other support will be needed to ensure that villages (who may have come to purchase as much as half their food thanks to their mine-related wages) can re-establish the ability to again grow all they need.
- Third, initiatives to identify and provide a poverty alleviation safety net for the most vulnerable -older people, children, and single mothers - who may be least able to find ways to cope when the community income drops.
- Fourth, and very importantly, revenue stability initiatives and possibly trust funds or other mechanism are needed to help local governments who are often faced with the twin difficulties at mine closure of income declining at the same time that service demands rapidly increase. Where mining communities have established living standards well above other non-mining communities in the region, a very difficult issue is whether to try and sustain these higher incomes after mine closure or let living standards fall back to the much lower level of non-mining communities.

In the case of Bolivia, Fernando Loaiza has reflected the deep and pervasive effects of a large world-class mining operation in a low-income developing country. In these situations, there is typically a temporary economic expansion, followed by a severe economic recession of the area surrounding the mine once the ore is depleted. Loayza observes that "the slump in economic activities triggers a technological retrogression with increasing negative impacts to worker's health and safety, as well as the environment."[140] In this situation, "members of the migrant population converted to miners, merchants or suppliers of services over time lose their roots and links with their original communities, forget agricultural skills, and get used to a new way of life."[141] Finally, Loayza recommends that "in low income developing countries an effective environmental plan to close large world-class mines should be based on both social impact assessment and environmental impact assessment. Only if the socioeconomic impacts of a large mining operation are considered and properly managed

[137] Except at Misima.
[138] Sometimes rather ferociously.
[139] Jackson, Richard, 2001.

[140] Loayza, Fernando. Lessons for Developing and Closing Mines in Non-Industrialized Countries. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999. Page 354.
[141] Loayza, op. cit. page 354.

from the outset of mining activities can the great social and environmental damage witnessed"[142] in the Bolivian Mine of Catavi,[143] be avoided.

In the United States, the National Environmental Policy Act requires federal agencies to consider social and cultural impacts of their proposed activities when making decisions which may effect those resources.[144]

Regarding whether social impacts are addressed in mine closure legislations, in the United States, the National Environment Policy Act (NEPA) of 1969 requires all federal agencies to analyze the impacts of their decisions. This includes analyzing the social and economic impacts of their decisions. The decision, however, of when to close an individual facility is normally made by the private mining operator based on economic considerations, the government usually does not enter into this part of the decision making process. Rather, the government looks instead at how that facility will be closed and reclaimed, and in making those kinds of decisions it will address social impacts.

Finally in this point, it seems that "more research is required on the socioeconomic effects of mine closure and their mitigation, and case study analysis needs to inform the drawing of lessons to design best practice corporate strategy and improved public policy."[145]

In Japan, legislation applicable to mine closure does not directly include norms related to social development and cultural changes.[146] On the other hand, government takes initiative in the guidance and inspection against the holder of the mining right, regarding danger to humans and mine pollution prevention of mine closure. This initiative is based on the Mine Safety Law. Furthermore, from the point of revitalization of local community, local government takes initiative regarding measures related to social impacts of mine closure by using various local assistance systems.[147]

3.7 Economic development

The positive hypothesis here is that skills developed by the people and infrastructure left behind by the mining company present opportunities for economic development.

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[142] Loayza, op. cit. page 354.

[143] Catavi mine is a Bolivian mine run by the State since its nationalization in 1952 and until 1986, date when the mine was closed.

[144] Bureau of Land Management, 2001.

[145] Warhurst, Alyson. Planning for Closure from the Outset: Towards Best Practice in Public Policy and Corporate Strategy in managing the Environment and Social Effects on Mining. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999. Page 502.

[146] The Mining Law, Mine Safety Law, and Special Law do not directly refer to the issue of community sustainability and mine closure. These laws were not designed to deal with the issue of community sustainability. Interestingly, the legislation related to coal mining does have same reference to community sustainability; local community maintenance is one of the goals of this legislation.

[147] Uematsu 2001.

On the other hand, it should also be considered that mine closure typically means a sharp drop in the standard of living for the local community and the region. Mine closure is often traumatic for local communities--especially in remote areas if local government is weak, labor productivity and non-mining incomes are low and labor mobility minimal. Careful consideration should be given to fiscal provisions and sharing the benefits from the mine to that they result in long term benefits to the community not simply short term consumption. In Papua New Guinea, there is a "Future Generations Fund" that protects some benefits for use by subsequent generations. There is also an infrastructure incentives scheme whereby, subject to certain rules, companies can use part of their income tax payments to construct infrastructure projects agreed with local communities. [148]

3.7.1 United States

The National Environmental Policy Act requires federal agencies to consider economic impacts of their proposed activities when making decisions which may effect those resources.[149]

3.7.2 Japan

It seems that to ensure economic development and legitimacy, decisions should be taken at the local level, decentralizing the system. In Japan, for example, MITI has a National Advisory Committee that discusses issues related to the promotion of coal mining areas, but generally power has been decentralized to the regional level. MITI expects local areas to take the initiative to establish and organize the structure to help the formation and establishment of new companies and their growth; to ensure that trained and educated workers will be available to these new enterprises, and to keep their region properly networked with markets for whatever is produced in the region.

In the case of Metal Mining, METI provided comprehensive concept, idea and plan such as "Recycle Mine Park Plan" for after mine closure for Local Governments and Metal Mining Companies and other related sectors. Each Sector took measures through their own initiatives under this concept and plan. METI didn't provide new and special subsidy system for mine closure. In Recycle Mine Park Plan, the plan consisted of suitable measures and systems which were established or provided by METI. METI's role is as general organizer, coordinator and promoter for plan.

The case of coal is somewhat different. Coal Mining was recognized important industry in Japan, METI formulated comprehensive policy and provided total plan and measures including subsidy system for Local Governments and Coal Mining Companies other related sectors.

MITI has declared that the ability of a region to take the initiative to get new industries established makes it more flexible in dealing with change and encourages self-motivation and self-reliance. It is, therefore, important that regions looking for new industries

[148] Strongman, 2000.
[149] Bureau of Land Management, 2001.

consider the sustainability of what is promoted. Industries related to the environment, and to medical and social welfare, are particularly promising for these ex-coal mining regions.

Now, from a legislative point of view, legislation applicable to mine closure does not include norms directly related to economic development.[150]

3.7.3 Philippines

In the Philippines, the mine's contribution to **community development** (90% of 1% of direct mining and milling costs) is managed through a Social Development and Management Program, SDMP, which should be used to provide sustainable livelihood opportunities for the employees and their dependants and the adjoining communities, to minimize the social impacts of mine closure.

The regulation describes who should benefit out of the 1% community development fund, and this are the people/community who directly host the project. However, it is relevant to explain that "money" is not exchanged directly but channeled to plans/projects/programs which the mining company and the host community agreed to undertake as part of their collective social development management program. Government acts as a third party but only as far as compliance to the intent and framework of the SDMP.

3.8 Relinquishment criteria

What are criteria that ensure comprehensive closure? Principles suggested by ANZMEC Strategic Framework for Mine Closure:

- A **responsible authority** should be identified and held accountable to make the final decision on accepting closure
- Once the completion criteria have been met, the company may **relinquish** their tenement without further obligations.
- A set of environmental indicators which will demonstrate the successful completion of the closure process should be established.

In general terms, relinquishment should reflect closure objectives being met. Signoff should be obtained from regulatory bodies and major stakeholders prior to relinquishment.

In South Africa, under the Minerals Act the mining authorization holder immediately prior to cancellation, abandonment or lapsing of the license, remains liable for complying with the relevant provisions of this Act until the Department of Minerals and Energy, DME, issues a certificate to the effect that the provisions of the Act have been complied with (section 12 of the Minerals Act). Rehabilitation of surface of land affected by mining must be carried out in accordance with the Environmental Management Programme (EMP)[151] as an integral

[150] Uematsu 2001.

[151] The mining company, according to the Minerals Act, is required to draw up an Environmental Management programme Report (EMPR). Included in the EMPR is the Environmental

part of the mining operations concerned, simultaneously with such operations and to the satisfaction of the Department of Minerals and Energy, DME, (section 38 of the Minerals Act). Where there is compliance with the undertakings given in Part 6 of the Environmental Management Programme, EMP, on closure, a closure certificate should be issued. In addition, the Regulations to the Act also provide (in 5.12.5 of the Minerals Act) that when the rehabilitation of the surface of a mine or any portion of a mine has been done to the satisfaction of the Department of Minerals and Energy, DME, in consultation with the Director-General of the Department of Water Affairs (DWAF) a certificate may be issued to the manager to the effect that the provision of these regulations, in so far as the rehabilitation of the surface is concerned, have been complied with.

It should be considered that each mine develops its own site specific EMP (based on the government model). It should also be considered that as a general rule, the mining company is liable for all aspects of environmental management under the act. The mine will not get a license without a EMP being approved. Only once the mine has satisfied all conditions of the act regarding closure and its own undertaking in the EMP with regard to mine closure will the government issue the mine with a closure certificate. Therefore, in theory the company is no longer liable under the mining legislation. It may still have residual liability at common law and under other non- mining legislation

The Environmental Management Programme (EMP) should be constructed within abroad public participation. Mary Stewart and Jim Petrie state that there is a need to have an objective set of guidelines within which the EMP operates and these guidelines "cannot be prescribed by the industry itself but should evolve out of a wide-ranging consultative process involving all interested parties. The EMP makes explicit provision for closure management, and identifies funding structures to achieve this. What it lacks is the ability to guide industry on how best to manage its day-to-day operations, both to minimize long-term impacts and to ensure that profitability remains high enough to generate the necessary closure funds."[152]

management programme (EMP). This EMP includes details company plans to ameliorate environmental impacts during the life of the process as well as post-closure.

[152] Stewart, Mary and Jim Petrie. Planning for Waste Management and Disposal in Mineral Processing: A Life Cycle Perspective. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999. Page 172.

4. Economic and Financial Considerations

There are real and significant financial considerations with respect to mine closure and site rehabilitation, especially given that closure and rehabilitation occur at a time when the operation is no longer financially profitable. Among others, "this is one major reason why governments are increasingly requiring companies to provide guarantees for mine closure, sometimes referred to as reclamation funds prior to a mine opening and it is important that these funds be established in accordance with both best accounting practices and in accordance with the tax provisions in the mine's jurisdiction."[153]

In many countries with underdeveloped economies, the lack of implementation of mine closure programs has resulted in significant adverse environmental impacts. As Nazari suggests, "in contrast to countries that have already implemented 'good international mining practices', these Economies in Transition have yet to develop a similarly sophisticated corporate governance, regulatory framework or financial and insurance market to address mine closure and secure its funding."[154]

The aforementioned situation leads to delays in developing projects and investments in this sector, "potentially inequitable distribution and externalization of closure costs, costly and time consuming tailor-made solutions on a case-by-case basis.[155] It also possibly creates the impression of 'penalizing' investors seeking financing or political risk insurance through international financial institutions, which typically require consideration of closure-related issues, from those accessing alternative capital markets.[156]

David R. Morrey (1999) has the view that within the U.S., the regulatory environment at both, state and federal levels has exerted significant economic pressure on mine operators. Specifically, increased stringency in standards for environmental protection on and around mines has a tendency to increase operating costs during production and capital costs at closure.[157] On the same token, as a result of increasing environmental awareness in the public sector, mine operators must be cognizant of contingent liabilities related to regulatory compliance and third party, common-law action. This awareness applies as much to the environments of developing countries as it does to industrialized nations.

It seems a fact that the most expensive closure components relate to physical rehabilitation of mine disturbance, and the elimination of long-term maintenance requirements and liabilities beyond closure. Nonetheless, with careful planning, technology selection, and

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[153] In some jurisdictions, these funds are required by law. Hoskin, Wanda. Mine Closure: The 21st century Approach. In Primeras Jornadas Iberoamericanas de Cierre de Minas, La Rábida, Huelva, España, 2000.

[154] Nazari, Merhdad. Financial provisions for Mine Closure. Mineral Resources forum, UNEP, 1999.

[155] Nazari, Merhdad. Financial provisions for Mine Closure. Mineral Resources forum, UNEP, 1999.

[156] With more limited requirements relating to closure funding, Nazari 1999.

[157] Morrey, David R. Integrated Planning for Economic Environmental Management During Mining Operations and Mine Closure. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999.

design, rehabilitation and closure costs can be significantly reduced, particularly if reclamation is performed concurrently with mining operations, and partial closures of exhausted mine components are completed within operational costs.[158]

Within the aforementioned context, there appears a need to set up a program to develop a policy and regulatory framework for financial provisioning related to mine closure. This program should be able to assist nations in developing the required framework to further promote and implement long-term environmentally sound and sustainable development in the mining sector. In this regard, "the program would also contribute to reducing the uncertainties associated with post-operational practices, and potentially related adverse environmental impacts and costs."[159]

Additionally, this program "would also facilitate the introduction of a standardized approach to this issue, establishing a 'level playing field with fixed goal posts' for regulators, investors, mining companies, and operators. The implementation of such a successful policy and regulatory framework would reduce the expectation and need to rely on governments and donors for financial assistance, effectively 'bailing out' the most severely impacted areas suffering from long term mining impacts."[160]

As it has already expressed, there are a range of financial surety instruments ranging from irrevocable letters of credit, performance bonds, trust or reclamation funds, insurance policies or other guarantees. "It is important that these funds become auditable items on a company's books so as to be reported on, and it is recommended that these funds be established under law and receive monies from the earliest days of operations."[161] Company closure plans should be updated regularly so as to be prepared in the event of the need for a mine to be put under care and maintenance or in the event of premature closure. Governments have a role in setting the policy and tax frameworks for these financial instruments.

In the United States and in Canada, as in many other parts of the world, governments attempt to manage environmental issues in mining through a number of ways. One such way is through economic and financial instruments designed to make mining companies internalize their environmental costs. These instruments may take the form of taxes, credits, rebates subsidies, penalties, etc. One of the advantages of using these instruments is that they encourage the industry to innovate in order to achieve the government's policy goals. The alternative is to have the government impose a system of command and control that is both difficult to establish and expensive to maintain.[162]

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[158] Dahlstrand 1995.

[159] Nazari, Merhdad. Financial provisions for Mine Closure. Mineral Resources forum, UNEP, 1999.

[160] Nazari, Merhdad. Financial provisions for Mine Closure. Mineral Resources forum, UNEP, 1999.

[161] Hoskin, Wanda. Mine Closure: The 21st century Approach. In Primeras Jornadas Iberoamericanas de Cierre de Minas, La Rábida, Huelva, España, 2000.

[162] Veiga et. Al. 2000.

In the absence of other regulatory requirements, accounting provisions are preferred by the mining industry to address mine-closure liabilities. This accounting transaction allows a company to make non-cash provisions for future mine-closure costs. However, this does not result in any actual cash flow for the purpose of accumulating closure funds. Unless the company has chosen to set aside actual funds for closure, when the project approaches the closure date, closure liabilities are likely to exceed the company's tangible book value. Any attempts to raise additional cash through the sale of mine assets is unlikely to raise sufficient funds to meet the closure requirements.[163]

At this point the company may be driven to declare bankruptcy rather than attempt to raise additional financing to cover their reclamation liability. Declaring bankruptcy serves to externalize the costs associated with mine-closure by passing on the liability to the government. With limited resources specifically budgeted for mine reclamation, government funding may well be inadequate to address the immediate and long-term environmental and safety impacts.[164]

To avoid the problems described in the above scenario, Canadian and US mining companies are not allowed to rely on accounting accruals alone to cover the costs associated with mine-closure. Instead the government requires that companies secure the necessary funding by providing guarantees for mine-closure funds prior to mine construction and operation. While these and other regulatory requirements have resulted in greatly increased costs to the industry, experience has shown that ultimately it is much more expensive to plan for reclamation during closure.[165]

In South Africa, like in other places, mining is a price taker, and as such is subject to global fluctuations in commodity prices that can impact significantly on the profitability of companies. The current state of the economy and the devaluation of the national currency directly impact on this issue. The apparent conflict between environmental and social issues (specifically job retention and creation amidst more stringent environmental requirements) was recognized a number of years ago.

As a mechanism to debate these issues, a committee was established as part of the Gold Crisis Committee (a tripartite structure including representatives of government, labor and industry). There are instances where conflict has arisen over this issue, for example, a gold mine that was polluting a water resource extensively, but also provided 6 000 jobs, was the subject of Parliamentary debate. No single solution has been found, and best attempts are being made to look for innovative solutions to the problem, being recognized among different South African stakeholders, that development issues are a priority in South Africa (without detracting from the need for environmentally responsible mining practices).

[163] Veiga et. Al. 2000.
[164] Veiga et. Al. 2000.
[165] Veiga et. Al. 2000.

4.1 Financial assurance systems

There is ample support to the idea that "financial mechanisms need to be in place to ensure sufficient resources exist at the end of the mine's life to implement closure plans, and fund appropriate compensation and redundancy schemes. Bonding regulatory systems could cover social as well as environmental issues."[166]

At the time of planning for closure, a company needs to have an estimate of the costs that would be involved. In this way, "in general, closure plans would involve objectives such as protection of water quality to desired levels, reduction of surface erosion, removal of equipment, and other mining related structures that could pose threats to the safety of the local community and its habitation of the land, in terms of quality and economic uses. For this, a company would need to have some estimate of the costs involved."[167]

Funding for closure involves setting aside funds progressively over the life of the mine so that sufficient funds are available to cover closure costs. Good cost estimates are needed in order to make sure that sufficient funds are available. Initial cost estimates should be prepared early in the mine life (preferably before the mine opens and should be updated systematically on a regular basis (every five years for a 30 years mine life, every two years for a 10 years mine life). If the mine is progressively rehabilitated during the operational phase, the cost at the time of final closure should be much lower. Various finding instruments exist, such as "closure bonds", warranties, securities and insurance—the key is that the resources exist for the mechanism to be used when it is needed. Such instruments can also be useful to provide funds for dealing with unexpected problems should they arise during or after closure. While they may be considered separately, "social" costs related to redundancy payments, trust funds, transfer of social assets, contributions towards future maintenance and operations of social assets also need to be estimated and funded.[168]

Principles suggested by ANZMEC Strategic Framework for Mine Closure:

- A cost estimate for closure should be developed from the closure plan.
- Closure costs should be reviewed regularly to reflect changing circumstances.
- The financial provision for closure should reflect the real cost.
- Accepted accounting standards should be the basis for the financial provision.
- Adequate securities should protect the community from closure liabilities.

[166] Warhurst, Alyson. Planning for Closure from the Outset: Towards Best Practice in Public Policy and Corporate Strategy in managing the Environment and Social Effects on Mining. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999. Page 502.

[167] Warhurst, Alyson and Ligia Noronha. Integrated Environmental management Through Planning for Closure from the Outset: The Challenges. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999. Page 28.

[168] Strongman 2000.

There exist many systems for providing financial assurance:

- Surety bonding
- Bond pools
- Non-surety collateral bonds, or trust funds
- Self-bonding or financial tests

Sureties bonding are business entities that agree to be responsible for the debts of another party, or the failure of another party to perform an action, typically a reclamation and closure action in mining. Sureties guarantee either that the costs of reclamation and closure will be paid, or that the reclamation will be performed. Surety bonds transfer the risk of environmental non-performance from the public to the surety. The surety assures that the miner will perform required reclamation and environmental protection activities.[169]

One obstacle, which arises with this mechanism, is that a sureties industry must exist, and it must, in turn, be regulated itself. The failure rate of businesses attempting to enter the sureties industry in the U.S. has historically been quite high. When the surety goes bankrupt, both the regulator and the mining firm lose.[170]

Bond pools are established to pay fore reclamation and closure costs incurred by bond pool members, in case of bankruptcy or other unforeseen events that render them financially unable to fulfill reclamation and closure commitments. Bond pools are often proposed to meet the needs of small operators, many of whom are unable or unwilling to provide the substantial collateral required by sureties firms. Membership in bond pools is voluntary. There is typically a test for entry, which includes evaluation of the following:[171]

- Compliance record, including number of permit violations
- Financial standing
- Years in operation
- Reclamation experience

Non-surety collateral bonds or trust funds are indemnity agreements made by the mine owner/operator, and they involve the mine owner/operator setting aside collateral, cash, or cash equivalent financial devices, equal in value to the estimated costs of reclamation and closure. These funds or assets are then held in trust by the regulator, the government, a bank, or similar financial institution. It is necessary to make clear from the start whether the interest earned of these funds while in trust is to be returned to the owner/operator or held by the government as compensation for administrative costs, offset of reclamation costs at sites where financial assurance was not sufficient, or as a source of funding to remediate abandoned mines.[172]

[169] Anderson 1999.
[170] Anderson 1999.
[171] Anderson 1999.
[172] Anderson 1999.

Self-bonding or financial tests. As Anderson states (1999) this approach is based upon evaluating the financial health of the mining firm, and acquiring assurance from the firm itself that sufficient funds will be set aside to carry out reclamation and closure obligations. Many large firms prefer this method of providing financial responsibility. There are significant advantages for the mine owner or operator, including tighter control of funds and savings in reduced transaction costs. One disadvantage to this approach is that there are times when even large companies which look good on paper must declare bankruptcy, leaving the public (government) to absorb the full costs of any reclamation, remedial actions and closure.

Mines projects change with time and because of this, most regulatory systems consider a procedure to adjust he amount of the financial surety through the existence of the mining project. However, there is no way to know for sure whether the assured sum will be enough to cover the necessary expenses. Sassoon explains us that "this is not due to any intent of malice on the part of the mine operator or incompetence of the regulatory authority. It is due to the fact that it is almost impossible to satisfactorily plan for closure at the start of a project that is likely to grow and evolve during its period of construction and operation."[173]

It seems that it is a good idea to demand a financial guarantee for newly permitted mines. The financial guarantee should consist of enough money to assure reclamation of the site at an agreed upon 'worst case scenario'. This encourages better mine operation and closure planning since generally mine planning becomes more efficient when money is involved.

4.1.1 The United States

In the United States, over the last several years, there has been a wave of bankruptcies in the precious metals industry as commodity prices fell. As a result, the Bureau of Land Management (BLM) and other state and federal agencies suddenly were faced with the prospect of closing a number of mining operations by themselves. The ability to successfully to reclaim and close these facilities was directly related to whether an adequate financial guarantee was in place to cover that cost. Those operations with an inadequate bond or without a bond are being maintained and/or closed to the extent possible as agency funding becomes available. In many these cases, final reclamation and closure will typically take much longer when compared to those operations with an adequate bond in place.[174]

In the United States, according to government, requiring a financial guarantee is a very good idea. It provides an incentive for the company to undertake the needed reclamation and closure so that company's obligations tied up in the financial guarantee can be released. And, in the event the company or operator defaults on their obligations there are then funds

[173] Sassoon, Meredith. Effective Environmental Impact Assessment. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999, page 112.
[174] Bureau of Land Management, 2001.

available to the agency with which to conduct reclamation and closure of the remaining facilities.[175]

In the State of Arizona, regarding amount and acceptable mechanisms, since April 1, 1997, owners and operators of exploration operations and mining units who create surface disturbances must provide financial assurance mechanisms to the inspector as provided by the Mined Land Reclamation Act, MLRA. Allowable financial assurance mechanisms include any or a combination of the following:

1. Surety bond.
2. Certificate of deposit.
3. Trust fund with pay-in period.
4. Letter of credit. 5. Insurance policy.
5. Certificate of self-insurance.
6. Cash deposit with state treasurer.
7. Evidence of ability to meet a corporate financial test or corporate guarantees as provided by 40 Code of Federal Regulations section 264.143(f).
8. Annuities.
9. Additional financial assurance mechanisms that are acceptable to the inspector.[176]

To establish the amount of financial assurance to be provided for an existing exploration operation or a new or existing mining unit, the inspector shall consider the costs of approved reclamation measures stated in the reclamation plan. In computing reclamation costs, the inspector shall assume that third parties will perform the reclamation measures. The inspector shall reduce the amount of the required financial assurance to the costs of the owner or operator performing the reclamation measures if the owner or operator can demonstrate sufficient financial ability to perform the necessary reclamation. Financial ability shall be established by one or more of the financial assurance mechanisms described in 40 Code of Federal Regulations section 264.143(f).[177]

The owner or operator of a new exploration operation shall furnish a financial assurance mechanism to the state mine inspector in an amount equivalent to two thousand dollars per acre of new surface disturbance, unless the inspector approves a cost estimate for an amount less than two thousand dollars per acre. An owner or operator may provide a single financial assurance mechanism for all of its exploration operations conducted in Arizona.[178]

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[175] Bureau of Land Management, 2001.

[176] Martin, Douglas K. (Arizona State Mine Inspector) Mined Land Reclamation Statutes and Rules. Division of Mined Land Reclamation, Arizona, January 1997, page 27 and 28.

[177] Martin, Douglas K. (Arizona State Mine Inspector) Mined Land Reclamation Statutes and Rules. Division of Mined Land Reclamation, Arizona, January 1997, page 28.

[178] Martin, Douglas K. (Arizona State Mine Inspector) Mined Land Reclamation Statutes and Rules. Division of Mined Land Reclamation, Arizona, January 1997, page 28.

In the State of California, a recent application of policy, legislation and practice regarding financial assurances is found in the Mine closure case of McLaughlin Mine.[179] The California State Mining and Geology Board's Financial Assurance Guidelines require that "The amount of the financial assurance should be calculated by the mine operator, a licensed engineer, or other professional experienced in the reclamation of mined lands, and based on:

1. An analysis of the physical activities necessary to implement the approved reclamation plan;
2. The lead agency's (or a third party contract) unit costs for each of these activities;
3. The number of units of each of these activities; and
4. An amount to cover contingency costs, (not to exceed 10% of the above calculated reclamation cost) and actual lead agency administrative costs. The calculated amount should not include the cost of completing the mining of the site. The value of mined material stockpiles located on the plant site should not be used to offset the cost of reclaiming the plant site. The estimate used in determining the calculated amount of reclamation of the physical plant site, e.g. dismantling or removing the equipment, structures, and related facilities, may be net of the surplus/salvage value of the facilities to be reclaimed."[180]

The arrangements to assure the availability of funds for the reclamation of the McLaughlin mine were provided for contractually by agreement among Napa, Lake, and Yolo Counties and the Regional Water Quality Control Board and a letter of credit held by the Bank of America as trustee ("Financial Assurance"). The amount assured by the letter of credit has been reviewed annually and adjusted to account for inflation as well as for new mining disturbances and reclamation previously carried out during the life of the mine.

Additionally, the company has declared that it "will continue to maintain some or all of the existing Financial Assurance, subject to adjustments for reclamation completion and inflation, with respect to each of the three Counties and the Regional Water Quality Control Board respectively until such agency accepts the reclamation work within its jurisdiction. Homestake expects to continue the Financial Assurance in effect with respect to amounts necessary to assure the on-going cost of operating and maintaining the mine waste disposal units for the foreseeable future."[181]

4.1.2 Canada

In the case of Canada, several provinces and territories are currently reviewing their regulations to account for problems that may occur after reclamation. The Government of British Columbia has been studying the possibility of requiring insurance from companies to cover costs of eventual accident after reclamation. All of the ten Canadian provinces, NWT and the Yukon have in place legislation that requires mining companies to specifically

[179] Homestake Mining Company, McLaughlin Mine. Closure Plan. July 16, 2001. Page 37.
[180] Homestake Mining Company, McLaughlin Mine. Closure Plan. July 16, 2001. Page 37.
[181] Homestake Mining Company, McLaughlin Mine. Closure Plan. July 16, 2001. Page 37.

set aside funds to be used for reclamation following mine-closure. In the event that the company later slips in bankruptcy, most provinces have in place a priority system for allocating funds for reclamation based on factors such as proximity to populated areas, public health and safety, and the protection of the environment.[182]

In Canada, financial requirements are under the Water Acts. According to Veiga, environmental assessment legislation "has too much room for discretion; is being improved to better account for process certainty. Orphaned or abandoned operations readily do not have satisfactory reclamation security attached to them and this is a disincentive for investment and re-mining. It also creates public relations problems, ecological/social impacts and government expenditure. In general, it is difficult to forecast financial resources required to reclaim a site; thus, secured finances may not be sufficient."[183]

From a doctrinal point of view, currently it is more or less accepted that project proposals and investment plans should include provisions for full decommissioning.[184] This is the case in Ontario. The Ontario Ministry of Northern Development and Mines in Canada produced a technical document "Rehabilitation of Mines: Guidelines for proponents." Which sets out principles objectives, and criteria for a mine closure and rehabilitation plan. Mining and quarrying companies in many countries now produce plans, which apply these, or similar guidelines to both existing mineral operations and to new proposals.[185]

Perhaps one of the most relevant challenges and difficult problems to solve in this area is to be able to adequately forecast and project the cost of reclamation. Veiga presents a recent effort. The Ministry of Mines of British Columbia has produced a generic spreadsheet[186] in an effort to ensure consistency in reclamation cost projections. The ultimate use of the land after closure is not specifically factored into the spreadsheet to determine the reclamation costs. This calculation is solely based on cost of raw materials, revegetation activities and earth moving.[187]

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[182] Veiga, Marcello, Stephen Roberts, Carlos Peiter, Glória Sirotheau, Maria Laura Barreto & Gilson Ezequiel. Filling the Void: The Changing Face of Mine Reclamation in the Americas. Department of Mining and Mineral Process Engineering, University of British Columbia, Vancouver, and CETEM - Centro de Tecnologia Mineral, Rio de Janeiro, 2000.

[183] Veiga, Marcello, Stephen Roberts, Carlos Peiter, Glória Sirotheau, Maria Laura Barreto & Gilson Ezequiel. Filling the Void: The Changing Face of Mine Reclamation in the Americas. Department of Mining and Mineral Process Engineering, University of British Columbia, Vancouver, and CETEM - Centro de Tecnologia Mineral, Rio de Janeiro, 2000.

[184] Coppin, N. J. and J. Box. Sustainable rehabilitation and Revegetation: The Identification of After-Use Options for Mines and Quarries Using a land Suitability Classification Involving Nature Conservation. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999.

[185] Op. cit.

[186] Information and/or copies of the spreadsheet may be obtained by contacting the Mines Branch, Victoria. http://www.em.gov.bc.ca/mining/mineper/permreq.htm

[187] Veiga, Marcello, Stephen Roberts, Carlos Peiter, Glória Sirotheau, Maria Laura Barreto & Gilson Ezequiel. Filling the Void: The Changing Face of Mine Reclamation in the Americas. Department of Mining and Mineral Process Engineering, University of British Columbia, Vancouver, and CETEM - Centro de Tecnologia Mineral, Rio de Janeiro, 2000.

4.1.3 South Africa

In South Africa, the Environmental Management Programme, EMP, must include a central chapter related to the legal requirement to set aside funds to be used at time of closure. The details and precise amount that is required is determined at the time of acceptation of the Environmental management Programme report (EMPR).

According to the South African authors, Andrew Parsons and John Kilani,[188] both from the Chamber of Mines of South Africa, "late in 1998, after having had to pick up the bill for some expensive mine rehabilitation work, the South African government decided that it would no longer accept any risk for rehabilitation of mines. The responsible mines' trust funds were not fully funded when they went into liquidation."[189]

Therefore, the government approach is nowadays a "risk zero" strategy. The idea is that any new permit and any new extension of an already approved project would be required to provide funding such that, at any given time during the life of a mine, there should be sufficient money available to meet the environmental liabilities likely to be incurred by the mine should it suddenly close down.[190]

The aforementioned authors esteem that several conclusions may be drawn from the South African experience:

- The less trust government has of industry, the less risk it will be prepared to shoulder.
- The failure of a couple of poorly managed operations to meet their obligations can have severe repercussions for the entire mining industry.
- Governments must require mines to provide financial assurance for their closure and post-closure liabilities. While responsible companies will make adequate provision, others will always be tempted to cut corners when times are tough.
- Government departments for oversight of mines' financial provision must have the necessary skills to police what companies are doing.
- Quick fix solutions seldom work. Since environmental liabilities for large mines are substantial, expecting them to be financed in one fell swoop may be prejudicial to the mine's survival.

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[188] Parsons, Andrew And John Kilani. Financial Provision For Mine Closure: Lessons From South Africa. Chamber of Mines of South Africa. Presented in Vancouver 2000.

[189] Parsons, Andrew And John Kilani. Financial Provision For Mine Closure: Lessons From South Africa. Chamber of Mines of South Africa. Presented in Vancouver 2000, page 5.

[190] Parsons and Kilani strongly criticize the new policy. In effect, they explain that "thus the new policy assumes that there is a high likelihood that any mine could suddenly close down, which is patently unreasonable." Furthermore, they warn that " If the government policy prevails, mines currently may either put additional money aside in the form of cash sureties or bank guarantees or not proceed with the planned expansion or seek an exemption. Putting extra funds aside is very expensive in most cases, and the industry is thus seeking to amend the policy." Parsons, Andrew And John Kilani. Financial Provision For Mine Closure: Lessons From South Africa. Chamber of Mines of South Africa. Presented in Vancouver 2000, pages 6 and 7.

4.1.4 Japan

Regarding the question whether a financial assurance for closure costs is required, mines in Japan have a high possibility of discharging continuous mine drainage including heavy metals. Therefore, it is necessary to secure mine pollution prevention after operation by the company. Twenty years of treatment funds are reserved. For securing funds, there is a funding system called "Mine Pollution prevention Fund System" and "Reserve System." The amount of funding will be decided with the approval of the Director of Inspection Department.

Bond release is not a subject regulated by the Special Law. Many mines were closed after the enactment of the Special Law. Mine waste water treatment is carried out continuously by the local governments and the holder of the mining right.[191]

Mine pollution prevention after mine closure is one of the core measures to be taken. However, mine waste water treatment has to be conducted permanently and requires a great deal of financial resources. With the fiscal budget reduction of both national and local government, it is difficult for the public system to continue assisting the cost of this measure. In the light of the above, cost reduction is a key aspect being currently considered by Metal Mining Agency of Japan (MMAJ), agency that is playing a leading role in searching ways to reduce costs through technological development.

It is a good idea to demand a financial guarantee from the holder of the mining right to secure and conduct all necessary mine pollution prevention measures. Under this consideration, a Special Law was established to set up a system that requires from the holder of the mining right to secure funds establishing a reserve.[192]

4.1.5 Brazil

There is an international trend to demand closure plans as part of the licensing process of new enterprises. In most cases, this Closure Plan contemplates programs of progressive rehabilitation, a long-term monitoring and a post-closure plan. The rehabilitation in on-going enterprises is usually in charge of the owner or current operator, but in some cases where the recovery is above the financial conditions of the company, the state might have to assume part or the whole cost of the rehabilitation. The greatest uncertainty is related to abandoned areas, where it is difficult to identify the responsible company. In this case the government might take the responsibility (SINGHAL, 1994).

Even if the Brazilian legislation does not define a statutory requirement for a Closure Plan, it establishes through the existent instruments the basis for its effective implementation. Meeting the requirements of all the stages of the permitting process and of all the compensations will assure an adequate behavior from the entrepreneurs, thus fully assisting one of the most polemic tasks, which deals exactly with the rehabilitation of the mining areas.

[191] It is difficult to count the number of closed mines since there are no specific laws for mine closure.
[192] Uematsu, 2001.

The idea of a financial assurance system for the mining activity is related to the Closure Plan, more specifically to the need of mine reclamation. The mechanism for ensuring that appropriate procedures are followed is a reclamation bond or fund supplied by the companies themselves. The company would get the money back by performing the required work. In situations of abandonment of the mining project due to market conditions or any other reason, the government would have funds to assure the rehabilitation.

In 1997 in Minas Gerais an environmentalist NGO (ANDA) presented to the Mining Chamber of COPAM a proposition, which demanded the confirmation of the investor's economic-financial reliability in mining projects, aiming at assuring the recovery of the degraded areas. Later on, this proposition was presented to the State Chamber, but it was not approved.

One of the main advantages of the adoption of these instruments is considered to be the incentive to mining companies in planning and conducting the rehabilitation programs, consequently reducing the administrative costs of the agencies of environmental control. On the other hand, the uncertain effects on the balance and cash flow could put the company at risk. Furthermore, some issues lack more precise answers and should be evaluated carefully:

- What are the models of deposit or assurance to be adopted and how would they be administrated?
- Certainly, the requirement for up-front funding, particularly in the form of cash, will be a problem to many companies.
- What should be the value of these deposits or assurances?
- There must be a balance. Investments should not be discouraged and the government must have enough funds to accomplish the rehabilitation in case the company fails in its duties.

4.1.6 Bolivia

The legislation in Bolivia, while not specifically addressing the subject of financial warranties does use other mechanism to guarantee that the closure plan is implemented. Three years after mine-closure an independent auditor is required to confirm that the company has implemented its closure plan. If the auditor approves the work, the company is exonerated from any further legal liability for the property.

4.1.7 Ireland

In Ireland, in agreeing on the surety arrangements for the Galmoy and Lisheen mines the authorities had to negotiate with mine operators because of the following considerations:

- while the authorities wanted certainty that the surety would last for the life of the mine, it is impossible to get open-ended sureties and very difficult to obtain them for more than ten years;

- the authorities had to be satisfied that :
  - the provider of the surety was a reputable agency and there was a negligible risk that it would itself be unable to comply if the surety should be called on;
  - the full amount would be available if the mine should close early, even though this was not a probable event;
  - the surety was irrevocable once entered into;
- the developer needed to keep the cost realistic, and in particular to avoid having to add to the pre-production costs by having to lodge the full cash amount at once against a remote possibility of closure in the first few years.

4.2 Government resources for administration and capacity building

In this part it will be analyzed how government resources for administrative purposes and capacity building have generated success stories.

Kathleen Anderson suggests "for financial assurance mechanisms to be successful there must be an industry, or perhaps a branch of government, willing to provide these services."[193] In fact, according to her, "this has been a problem in the U.S., as many of the firms that provided financial assurances went bankrupt themselves, leaving governments and taxpayers with financial responsibility."[194] She finally suggests that "regulators may want to have a plan in place for when those providing financial assurance cannot or will not, pay."[195]

According to Nazari, countries from economies in transition,[196] and this can safely be extrapolated to underdeveloped countries as well, face the following challenges and problems to implement a sound financial system related to mine closure:

- Environmental liabilities resulting from on-going operations;
- Involvement of some 'junior investors' which have, unlike many major mining
- Companies, limited resources to back-up the mining company's obligations and, sometimes, exhibit a more limited appreciation of reputation risks;
- The involvement of state-controlled enterprises, sometimes with very limited access to financial resources and state-of-the-art know-how;
- Some agreements explicitly or implicitly allocating closure-related liabilities to the local partner or government towards the end of the economic life of the project, by, for example, transferring of all assets;
- Lack of enforcement of local environmental regulation;

[193] Anderson, Kathleen. Using Financial Assurances to manage the Environmental Risks of Mining Projects. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999. Page 292.
[194] Anderson, op. cit. Page 292.
[195] Anderson, op. cit. Page 292.
[196] He defines economies in transition as those countries from East and Central Europe that use to be part or under the influence of the former Soviet Union.

- Lack of awareness and influence on the part of the potentially affected public; and
- Lack of transparency as contractual arrangements addressing mine closure activities and related costs are generally treated as confidential.[197]

In the United States, the Mining and Minerals Policy Act of 1970 (30 U.S.C. 21a) established the policy for the Federal Government relating to mining and mineral development. The Act states that it is policy to encourage the development of "economically sound and stable domestic mining, minerals, metal and mineral reclamation industries." The Bureau of Land Management will accept the following instruments for financial assurances:

- Surety Bonds,
- Cash,
- Irrevocable letters of credit,
- Certificates of Deposit,
- Negotiable United States Government State and Municipal securities or bonds,
- Investment-grade greater securities,
- Insurance.[198]

[197] Nazari, Merhdad. Financial provisions for Mine Closure. Mineral Resources forum, UNEP, 1999.

[198] Bureau of Land Management, 2001.

5. Public Participation

5.1 General considerations

5.1.1 Principles and Guidelines

There is increasing public awareness in the different countries with significant mining, which has arisen for a number of reasons. These include globalization, increasing activity by various NGOs in environmental and sustainable development issues, the public being more informed, legal challenges being brought against the industry, and so forth.

Consultation and discussion with the communities directly affected by the mining project should be done also at the planning stage. This will allow identification of the role of all stakeholders and the expectations and interests of the landowners are taken into account and planned for earlier rather than towards the end of mine life, which is the case with existing projects. The landowners should decide on the use of facilities and infrastructure and a sustainable land use after mining. This aspect needs careful work and refinement as the mine life draws to a close. (Hancock 1999) Furthermore, it is considered that consultation "throughout is paramount, assisted by participative approaches to forward planning so as to involve the community from the outset in addressing eventual closure and future options."[199]

Principles suggested by ANZMEC Strategic Framework for Mine Closure:

- Identification of stakeholders is an important part of the planning process.
- Continual consultation with stakeholders should occur throughout the life of the mine.
- Effective consultation is an inclusive process which encompasses all parties.
- A targeted communication strategy should reflect the needs of the stakeholder groups.
- Adequate resources should be allocated to ensure the effectiveness of the process.

Communities often become overly dependent on the mine to provide its needs. For example, as workers give up agriculture to work for the mine and as cash mine wages flow into a community, the result is that the community starts to "import" part of their food supply and their food security and self-sufficiency is reduced. Dependency is often increased because communities have often been "kept in the dark" about the mines activities and future and thus are not encouraged to plan for the future or better manage their own affairs. Communities, with the help of the mine, local government and NGOs, can instead make efforts to plan for themselves – especially by having their representatives actively participate in the regional planning process. Most importantly they can make sure some of the mining benefits are used to build long term assets.[200]

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[199] Warhurst, Alyson. Planning for Closure from the Outset: Towards Best Practice in Public Policy and Corporate Strategy in managing the Environment and Social Effects on Mining. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999.

[200] Strongman 2000.

In some cases, artisanal and small scale miners wait for the mine to close so that they can take over the site for small mining. Such mining can be highly destructive. This happened at the Mount Victor mine in Papua New Guinea where much of the environmental protection undertaken at mine closure was subsequently undone by illegal miners. Such actions can be very difficult for regulators to prevent. But the local community can have a say in the matter and has a potentially very important role to play in protecting the environment after the mine is closed.[201]

According to Mitchell (1999) it is necessary that there is a reasoned debate between all stakeholders, but particularly operators and regulators, to rigorously define the best environmental options for operational and closure practice within a framework of economic viability and international competitiveness. The current debate between the national Mining Association and the USEPA regarding the future status of certain mineral processing wastes and the use of leaching tests to define the chemical stability of wastes is an excellent example of polarized and polemical confrontation that benefits neither party in the long term.

In the United States, a recent example of multi-stakeholder participation that is progressing successfully is the issue of surrounding land use of the McLaughlin Mine. The majority of the lands surrounding the McLaughlin mine are public lands administered by the Bureau of Land Management and the State Department of Fish and Game along with a scattering of large private ranches. The development of the McLaughlin Reserve (explained earlier in this report) and the disposition of Homestake's surplus lands triggered discussions among these surrounding private land owners and public land managers about the future management of the region along the Blue Ridge stretching south from Bear Valley in Colusa County through parts of Lake, Yolo, and Napa Counties to Solano County along lower Putah Creek.[202]

Since 1996, several stakeholders have met once a month and created the Blue Ridge-Berryessa Natural Area Conservation Partnership. Participating public agencies include Napa, Lake and Yolo Counties, the Bureau of Land Management, the Bureau of Reclamation, the State Department of Fish and Game and the University of California and its Natural Reserve System. Private partners in addition to Homestake include the Morgan Valley Ranch, the Gamble Ranch, the Todd Ranch, the Bear Valley Ranch, the Vasconi Ranch, the Erasmy Ranch and the Lake Berryessa Resort Owners Association.

Participating Non-profit organizations include the Land Trust of Napa County, the American Land Conservancy, the Napa County Farm Bureau, the Bay Area Open Space Council, the Cache Creek Conservancy, the California Wilderness Coalition, the Quail Ridge Wilderness Conservancy, the Rocky Mountain Elk Foundation, and the California Rangeland Trust.[203]

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[201] Strongman 2000.
[202] Homestake Mining Company, McLaughlin Mine. Closure Plan. 2001. Page 11.

[203] Homestake Mining Company, McLaughlin Mine. Closure Plan. 2001. Page 11.

5.1.2 Identifying Stakeholders

Identification of stakeholders is an important part of the planning process and the question here is to determine how is this best addressed in legislation.

Stakeholders are those parties with a direct involvement in the mine closure process. They are distinct from Interested Parties, who have an interest in, but not a direct involvement in, the process or outcomes of mine closure. Identifying key stakeholders and developing a good relationship with them is fundamental to a successful closure process. (ANZMEC 1999)

Following ANZMEC 1999 scheme, Stakeholders fall into three broad categories, the company, the community and the State:

1. The Company

Key company stakeholders include:

- Employees: employees facing job loss have an obvious and immediate stake in mine closure.
- Management: in order to promote continuity of corporate knowledge and consistency of approach to the post-mine rehabilitation and closure process, it is also important that selected managers and company environmental personnel be encouraged to continue their involvement beyond the cessation of production.
- ä Shareholders: shareholders need to be fully informed of their company's obligations for closure.

2. The Community

The impacts of closure on the community will vary with the degree of community dependence on, or involvement in, the mining project. In some cases, the community will not survive the loss of the mine. At a community level, consultation is also important to avoid building up false expectations about the outcomes of closure. Significant community stakeholders include:

- Local business and service providers: the economic effects of mine closure on local business and service providers may be severe, and these stakeholders are entitled to consultation to assist their own planning for the transition.
- Landholders, neighbors and nearby residents: this group may be physically affected by the closure and may have particular needs and desires that can be incorporated into rehabilitation planning.
- Local government: in addition to their direct involvement with the mining operation, local government provide a vital link with the community. Early consultation and planning is essential to minimize disruption to community services.

3. The State

The needs of government agencies must be satisfied if lease relinquishment is to be achieved. Consultation with these agencies is essential to ensure that rehabilitation and closure plans satisfy regulatory requirements. Important government stakeholders include:

- The Responsible Authority and other regulators: a key role of the Responsible authority is to coordinate the functions and needs of other government agencies with accountabilities in the area.
- The land management agency: where the land management agency (current or future) differs from the Responsible Authority, there is a need to ensure that their requirements are an integral component of the closure process.
- Other government agencies: the potential effects of closure on the community and individuals may necessitate consultation with government agencies, such as community welfare and employment, which have not previously impacted on the mine management.

5.1.3 Role of Stakeholders

The World Bank places great emphasis on consulting with stakeholders and suggests that these consultations should be done at all stages of the project.

According to Strongman,[204] there is a fundamental divide between the interests of mining companies and the interests of the communities where mining takes place. Mining companies typically want to develop mines, achieve a good return for shareholders, then leave when production is finished - so that they can develop more mines and continue to produce elsewhere. Communities on the other hand want to see wealth and income opportunities created in their midst that will last over time - so that the community standard of living improves and successive generations can live better than their forebears. However, everyone does not share this vision. According to others, this would be an outdated generalization. Respectable mining companies and nations are achieving new levels of understanding and cooperation with local communities and the wider community. With few exceptions, the viability and commercial success of mining is now contingent upon meeting community needs and aspirations.

In any case, consultation offers the vehicle to bridge this gulf. If done well it offers important possibilities to improve mine design and operation, to undertake joint monitoring (for example the Porgera Mine in Papua New Guinea) and could also lead to joint decision making especially regarding social assets before and after mine closure. Thus, there is a business case for consultation - especially for mining companies that want to see the local community benefit from their presence - and see benefits sustained after the mine closes.[205]

Many NGOs see their main role as monitoring the performance of mining operations. While this can be a useful role if done in a constructive manner, there is an equally if not

[204] Strongman 2000.

[205] Strongman 2000.

more important role for NGOs to play in helping local communities to strengthen their planning and leadership capacities. NGOs can help communities avoid reliance on handouts and over dependency on mining for services and economic activities. They can also play a very valuable role in helping to operate social assets and infrastructure if it fit with the capabilities and missions (e.g. church agencies) if Government does not have all of the needed capacity. For example, NGOs are helping train local Government officials in Papua New Guinea, provide micro enterprise finance in Romania, undertake innovative rehabilitation programs in Niger and manage mining company initiated community projects in Indonesia. In this regard, mine-related Foundations (such as the Rio Tinto Foundation) may have a useful role to play both before and after mine closure.[206]

5.2 Legislation on public participation – general and on closure

5.2.1 South Africa

In South Africa, the environmental legislation in particular the Environmental impact Assessment, EIA, Regulations have far reaching provisions beginning from the scoping phase that include consultation with I&APs so the public is becoming more sensitized to being consulted. The principles included under the National Environmental Management Act, NEMA, also make it clear that public consultation is essential at the earliest feasibility stage of projects. These require that the participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured. The new draft mining legislation spells out clearly the role of I&APs and makes provision for how their input and concerns must be addressed.

5.2.2 United States

In the United States, the National Environment Policy Act of 1969 requires all federal agencies to seek public comment in order to analyze the impacts of their decisions. For example, the BLM when preparing an environmental impact statement, typically publicizes a 30-day scoping period. During this scoping period, the public can view the project that is being proposed and can send comments to the BLM on what the issues and conflicts they may have with it. Public meetings are usually held as well to present the proposed project and take comments verbally. Following the scoping period, the BLM prepares a draft EIS which is released for a public review of between 30 to 90 days. Public meetings are again held to present the findings of the EIS, as well as, to take public comments. The public can also send in written comments. A Final EIS is prepared which includes all the comments received with responses to those comments. Based on comments received, modifications or additional mitigating measures may be incorporated into the Record of Decision authorizing the proposed project following the final EIS.[207]

[206] Strongman 2000.

[207] Bureau of Land Management, 2001.

In the United States, it has been said "the public is a watchdog over both state and federal inspectors. Members of the public who have complained are allowed to accompany inspectors during inspections."[208] Legislation, policy and practice give the public a broad range of participation possibilities. In effect, both complainants and mining companies may avail themselves of a complex array of administrative and procedural remedies ranging from informal conferences at which all may be present to appeals of most types of decisions, usually to more than one administrative level. Individual discretion is tightly controlled.[209]

In Arizona, there is specific legislation touching the issue of public participation regarding mine closure. The Mined Land Reclamation Act, MLRA, is the core piece of legislation regulating the issue at stake.

The Act rules that the state mine inspector shall make available to the public any records, reports or information obtained or prepared by the inspector, unless a notice accompanying the information or any part of the information states that the information is a trade secret or is otherwise confidential to the party's competitive position.[210]

If the inspector, on his own or following a request for disclosure, disagrees with the trade secret or confidential notice, the inspector may request the attorney general to seek a court order authorizing disclosure. If a court order is sought, the party shall be served with a copy of the court filing and has twenty business days from the date of service to request a hearing on whether a court order should be issued. The hearing shall be conducted in camera, and any order resulting from the hearing is appealable as provided by law. The inspector may not disclose the confidential information until a court order authorizing disclosure has been obtained and becomes final. The court may award costs of litigation including reasonable attorney and expert witness fees to the prevailing party.[211]

The inspector shall make available to the public the following information obtained from any person pursuant to the chapter on public participation of the aforementioned Act:

1. The name and address of any plan applicant.
2. The proposed post-mining land use or uses.
3. A general description of the proposed reclamation measures.[212]

The inspector may disclose, with an accompanying confidentiality notice, any records, reports or information obtained by the inspector or the employees of the division of mined land reclamation to:

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[208] Danielson, Luke and Marylyn Nixon. Current Regulatory Approaches to Mine Closure in the United States. In Warhurst, Alyson and Ligia Noronha Ed. Environmental Policy in Mining: Corporate Strategy and Planning for Closure. Lewis Publishers, Boca Raton, 1999.

[209] Danielson & Nixon 1999.

[210] Mined Land Reclamation Act, MLRA, 27-930.

[211] Martin, Douglas K. (Arizona State Mine Inspector) Mined Land Reclamation Statutes and Rules. Division of Mined Land Reclamation, Arizona, January 1997, page 16.

[212] Martin, Douglas K. (Arizona State Mine Inspector) Mined Land Reclamation Statutes and Rules. Division of Mined Land Reclamation, Arizona, January 1997, page 17.

1. Other state employees concerned with administering this chapter or if the records, reports or information is relevant to any administrative or judicial proceeding under this chapter.
2. Employees of the United States environmental protection agency if the records, reports or information is necessary or required to administer and implement or comply with federal statutes or regulations.[213]

The concept "trade secret" means, within the context of the Act, information to which all of the following apply:

1. A person has taken reasonable measures to protect the information from disclosure and the person intends to continue to take those measures.
2. The information is not and has not been reasonably obtainable by legitimate means by other persons without the person's consent, other than by governmental entities and other than in discovery based on a showing of special need in a judicial or quasi-judicial proceeding.
3. A statute does not specifically require disclosure of the information to the public.
4. The person has satisfactorily shown that disclosure of the information is likely to cause substantial harm to the person's competitive position.[214]

5.2.3 Canada

An important initiative that should be taken into account by policymakers reflecting upon public participation policies, because of its success and the broad participation it included, is the Canadian "Whitehorse Initiative." This initiative was a consultation among six primary stakeholders including mining industry executives, federal government officials, officials from several ministries, government officials from several provinces and territories, trade unions representing mining workers, non-governmental environmental organizations and Aboriginal people which led to a number of consensus documents. Even more important, it created an experience of dialogue and mutual understanding.

5.2.4 The Philippines

In the case of the Philippines, mine rehabilitation takes place through an Environmental Protection and Enhancement Program (EPEP) and a Social Development and Management Program (SDMP). Replenishable trust funds guarantee the availability of financial resources to implement them. The EPEP undergoes preliminary evaluation by the Mine Rehabilitation Fund Committee (drawn from MGB[215] and DENR,[216] the local government,

[213] Martin, Douglas K. (Arizona State Mine Inspector) Mined Land Reclamation Statutes and Rules. Division of Mined Land Reclamation, Arizona, January 1997
[214] Mined Land Reclamation Act, MLRA, 27-930.

[215] Mines and Geosciences Bureau.
[216] Department of Environment and Natural Resources.

local community organization and the mining contractor), and is then examined by the Contingent Liability and Rehabilitation Fund Steering Committee (CLRFSC).

The CLRFSC brings together many agencies and disciplines, and this is a cause of delay. Once this Committee approves the EPEP, the major stakeholders formally establish the Contingent Liability and Rehabilitation Fund (CLRF). From the approved EPEP, the contractor prepares an Annual EPEP, and funds to ensure implementation of this are provided by the levy of 3 - 5% on the annual direct mining and milling costs.

5.2.5 Papua New Guinea

Consultation has become a key element of the closure process in PNG. With no specific guidelines so far[217] to provide a framework, Mine Closure Committees with membership from all stakeholders are set up with the primary task of developing and implementing a Mine Closure Plan. The Plan addresses both biophysical and socio-economic issues. The Final Mine Closure Plan requires government approval before it is implemented.

The national draft policy was debated widely at a three day open conference of all stakeholders in April 2000 and after corrections having been made to it was also further discussed with companies, NGOs and government agencies in November, 2000. All individual mine closure plans have been widely discussed by all stakeholders. However, at Misima and Porgera the process has gone further. At Misima the company (Placer Dome) brought in a third party to 'empower' villagers so as to enable them to plan their own futures. This almost worked – villagers drew up sensible plans of their own. Unfortunately at the last step – the amalgamation of village plans into a district plan – the outside organization collapsed and the process stopped in its tracks. However, villager awareness was successfully raised. At Porgera, since 1985 village leaders have held firm convictions as to their area's future development and have held on to these views for 16 years evolving ideas over time (they didn't need empowering) whilst organizing themselves very tightly to ensure their views were heard.[218]

[217] PNG has not had a specific Mine Closure Policy or Law except de-commissioning provisions in the Contracts signed with the developer of the project. These provisions deal with infrastructure and mine facilities as well as rehabilitation issues, particularly the pit and dump areas. The Dept of Mining and the Office of Environment and Conservation are responsible for each of these areas. The Government of PNG is currently drafting a Mine Closure Policy. The draft document addresses not only the Biophysical issues but also the Socio-Economic issues as well. There is also a provision relating to financing of closure and the risks associated with early closure. A Mine Closure Bond has been suggested to kick in during the operations of the mine so that sufficient provision is in place to finance mine closure. There is also a provision for development of a conceptual mine closure plan, which must be submitted, with the Development Plan before government approval is granted for development. This Plan is then modified as development progresses and a final document is required for government approval 5 years before actual closure.

[218] Jackson, Richard, 2001.

5.2.6 Japan

In Japan, decisions regarding environmental measures related to mine closure do not include a process of public participation. The owner, national government and local government conduct mine pollution prevention measures according to the pertinent Acts.[219]

5.2.7 Bolivia

There are several laws and regulations that recognize public participation rights. According to the Environmental Law, the government should create special mechanisms and procedures to guarantee the participation of native communities in the planning process of sustainable development and use of natural resources, considering their specific cultural, social and economic characteristics.

At the Public Participation section of the Environmental Law, it is said, "all the persons has the right to participate in the environmental management and the obligation to be actively involved in the community to protect the environment". The right of information is also assured. There is a specific Law for Public Participation passed in 1994 that recognize and promote the participation process, articulating the indigenous communities into the political and economic institutions. Peasant communities, indigenous groups and neighbors associations have the right to participate and promote actions toward the preservation of the environment and the ecological equilibrium.

5.2.8 Ireland

Once the Mining Project application is received by the Environmental Protection Agency[220], any person can make a submission to the Agency regarding the application. Following an assessment of the application and any submissions received, the Agency can grant a licence without conditions, grant a licence subject to conditions or refuse a licence. At this point in the process any person has 21 days to examine the proposed determination and make an objection to the Agency and the applicant has 28 days. When all the objections have been considered by the Agency, a final decision is made, either to grant an Integrated Pollution Control, IPC, licence with or without conditions or to refuse a licence.

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[219] Uematsu, 2001.

[220] The Environmental Protection Agency is an independent body, set up under the Environmental Protection Agency Act, 1992. It was formally established on 26 July 1993 with the purpose of protecting Ireland's natural environment. A Director General and four other directors manage the Agency. All five directors have been appointed by the Government on a full-time basis and operate as an executive board. The procedures for selecting this board and the wide range of functions it carries out reinforces the independence of the organization. Ireland is among the leaders in Europe in establishing an independent Environmental Protection Agency with wide executive functions. These include strong regulatory and enforcement powers relating to all activities with potential for major pollution, along with supervisory and support services for public bodies, including local authorities, engaged in activities that may affect the environment. The Agency advises on public policies and objectives, encourages sustainable development and exercises a precautionary approach. Applying the 'polluter pays' principle, the Agency aims to achieve a balance between environmental and developmental needs.

The Agency's licensing procedure encourages public participation and any views expressed are fully taken into account in the Agency's decision.

5.2.9 Peru

Citizens' participation in the approval of Environmental Impact Assessments is contemplated in the Constitution of Peru and in the Environmental and Natural Resources Code. In the Energy and Mines sector Ministerial Resolution 728-99-EM/VMM regulates it.

All Environmental Impact Assessments for new operations are subject to public consultation. For this purpose, a procedure is in place for the participation of interested parties, who are notified through publications in the official gazette and local newspapers. The interested parties have the right to receive a summary, to review the studies and to participate in Public Hearings, where they may submit in writing or orally any observations to the projects, which must be answered by the companies before the projects are approved.

5.2.10 Chile

In Chile, there is a detailed system of public participation related to the "Environmental Impact Assessment" System.[221] According to this legislation, the public has the right to participate in the environmental impact evaluation of any mining project. This participation includes opinions regarding the issue of the proposed mine closure from the mining operator. There is no, so far, a public participation system within the mining sector.

[221] Law 19.300 Environmental Framework, from 1994; and By-Laws 30, on Environmental impact Evaluation, from 1997.

6. Final Considerations

6.1 A Few Questions

All closures are different depending on local circumstances but some key issues seems to emerge:

- How are funds generated during operations divided both between parties and between present and future expenditures?
- How much regional infrastructure built up during operations is maintainable after closure?
- How well funded and competent are local level governments?
- Has the project's presence changed (positively) the region's access to the rest of the world? (Essential for sustainability where mines are located in remote areas).
- What long-term environmental impacts will be left behind?[222]

6.2 A Few Working Propositions

6.2.1 Background

The first finding of this study is that mine closure policies varies significantly from one region to another, furthermore, they differ from one country to another within the same region.

There are a few countries with a mature mine closure policy, like the United States, Canada, Japan and Australia. Most other countries do not have properly a mine closure policy or it is in a very early stage of development or it is simply not properly implemented.

It seems that there exist geographical, historical, legal and economic factors that partially explain the difference among these policies. Furthermore, it seems that the aforementioned differences would prevent the implementation of one singular set of policies equal everywhere. On the contrary, it seems that it work best to be sensitive to differences and thus, not to attempt the imposition of a singular comprehensive mine closure system. Regions and countries differ in several ways and therefore each of them should be considered as a separated unity. Policies should emerge taking into consideration all the aforementioned differing factors.

However, the aforementioned does not mean that it is not possible to observe and find common features, needs and ideas that seem to have worked well regardless of geographic or legal background. On the same token, it also seems that there are a few policy constants that

[222] Jackson, Richard, 2001.

appear to be advisable to be implemented in every mining country dealing with the issue of mine closure.

The following paragraphs will state a number of working propositions that appear to be applicable to all cases and whose purpose is to open a debate upon them.

6.2.2 General Principles

This part brings together a number of ideas central to public policy and which may be used to structure a mine closure policy regime.

- There should be a plan for mine closure.
- Legislation governing mine closure should be modernized.
- There should be a search for more appropriate technological alternatives for implementing a mine closure plan.
- There should be a search for more economically appropriate alternatives for carrying out mine closure.
- Governments should take into account the interest and opinions of civil society, especially those communities directly affected by mining enterprises.
- The experiences of those countries which have a well developed mine closure policy regime should be taken into account.
- Specific standards or closure requirements should reflect a careful balancing of the benefits and costs of the standards or requirements.
- Policies should be designed to encourage mine owners to achieve a specific standard or requirement at lowest cost.
- Policies should be designed to encourage or provide incentives for technological innovation in mine closure, to reduce costs of compliance (economic incentives tend to provide greater incentives for innovation than technology or performance standards).

6.2.3 Legal and Institutional Issues

This part brings together a number of ideas related to legislation, and includes statutory law directly related to mining as well as institutional aspects, that is, the form of governmental organization used to administer the policy regime.

Wanda Hoskin, from UNEP, has declared "while current policy and legislative frameworks vary widely around the world, it is increasingly important that countries formulate clear, stable and predictable policies for industry to follow. These policies can evolve but should not fluctuate nor be unequally applied. It is equally important to recognize that each mine is unique, that some flexibility will be required as the mine operates and that artisan, hard rock and coalmines and aggregate operations are different."[223]

[223] Hoskin, Wanda. Mine Closure: The 21st century Approach. In Primeras Jornadas Iberoamericanas de Cierre de Minas, La Rábida, Huelva, España, 2000.

Guiding Principles:

- All mines should have a closure plan and the combined set of activities should comply with existing regulations.
- The competent authority must approve the closure plan.
- The aforementioned competent authority shall verify regulatory compliance for all or part of the actions or commitments of such a closure plan.
- The implementation of a closure plan maybe carried out gradually beginning with the closure start-up.
- Should there be any changes in regulations governing these matters, or any other technological or operational alterations, the mine closure plan may be modified.
- Once the plan is put into operation, the competent authority shall issue a recognition of the same that, in certain cases, may be only partial.
- Each closure plan will address specific requirements according to the particular features of each mine.
- The closure plan should set out the financial means for ensuring its subsequent execution.

Purpose:

- To be able to count on a body of systematic regulations that approach mine closure in an integral manner.
- To be able to count on a modern and efficient governmental administration and supervision of the entire policy regime affecting mine closure.
- To achieve harmonization of all such policy regimes in the Americas.

6.2.4 Financial Issues

This part discusses the various issues related to the financial dimension of such a policy regime, especially whether or not there should be financial guarantees (bonds) and what the principles guiding and structuring such guarantees should be.

Main Criteria:

- There should be some form of a bond or other instrument of economic value authorized by the competent authorities that would ensure compliance with the mine closure plan.
- Such a bond should be in the form of a financial instrument or instruments.
- There should be a financial risk assessment of the company involved.
- There should be penalties for failure to comply with posting bond.
- There should be a post-closure fund for covering the costs associated with environmental protection after completion of the closure plan.

- The government shall be responsible for overall environmental liability.

Bond Characteristics:

- It must be sufficiently large to convince the competent authority that closure plan activities will be complied with in their entirety.
- In all cases it must be set at a particular amount.
- The bond should not be understood as a tax.
- It must be free from any associated levies.
- The return of the bond will be consequent upon the mining enterprise carrying out satisfactorily all activities included in the closure plan.
- There must be a policy in place for ensuring the execution of closure plan activities if the mining enterprise fails to comply with the same.
- Consideration should be given to an additional amount on top of the overall cost of the mine closure plan to cover the eventuality that the government might have to carry out the specified closure plan.
- The amount of the aforementioned bond should vary according to the complexity of each closure plan.

Financial Instrument Characteristics:

- The financial instruments forming the bond should be acceptable in the formal secondary market.
- Readjustment for fluctuations should be considered.
- They should be authorized by the appropriate risk classification agency.
- They should be of ample liquidity and easy placement.
- They should be governed by the usual financial regulations set out by the national government.
- Such financial instruments should be substitutable with prior authorization.

6.2.5 Technical issues

The principal purpose of developing any policy regime on mine closure is to prevent, minimize, and/or control the risks and negative effects on the health and security of persons, or the environment, that may be created by the cessation of mining operations and which may continue to influence adjacent areas.

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Annex 2 - Websites

GENERAL INFORMATION SITES

ANMED
http://www.agso.gov.au/anmed/anmed.html

CAMMA Mines Ministers of the Americas
http://mmsd1.mms.nrcan.gc.ca/mmsddev/camma/default.asp

GEMEED-APEC
www.gemeed.cl

INFOMINE
http://www.infomine.com

Mineral Resources Forum
http://www.natural-resources.org/minerals/index.htm

MPRI-IDRC
http://www.idrc.ca/mpri

U. S. Geological Service
http://www.usgs.gov

AUSTRALIA

ANZMEC Australia and New Zealand Minerals and Energy Council
http://www.isr.gov.au/resources/anzmec/index.html

Bureau of Resources Sciences
http://www.brs.gov.au

CSIRO Exploration and Mining
http://www.dem.csiro.au

Minerals Council of Australia
http://www.minerals.org.au

New South Wales
Department of Mineral Resources
http://www.minerals.nsw.gov.au

Queensland Department of minerals and Energy
http://www.dme.qld.gov.au/page2.htm

Western Australia Department of minerals and Energy
http://www.dme.wa.gov.au

Department of Industry, Science and Resources
http://www.isr.gov.au

BOLIVIA

Bolivian Government
www.desarrollo.gov.bo/mde/leyes/minería

National Congress
www.congreso.gov.bo

Ministry of Economic Development
www.desarrollo.gov.bo

Vice-Ministry of Mining and metallurgy
www.boliviamining.com

Ministry of Public Information
www.comunica.gov.bo

BRAZIL

Brazilian Bureau of Mines
http://www.dnpm.gov.br/dnpmeng1.html

CANADA

Alberta Coal and Minerals
http://www.energy.gov.ab.ca/coal/index.htm

British Columbia Ministry of Energy and Mines
http://www.gov.bc.ca/em

CIDA Canadian International Development Agency
http://www.acdi-cida.gc.ca/index.htm

Minerals and Metals Sector, Natural Resources Canada
http://www.nrcan.gc.ca/mms/ms-e.htm

Mining Association of Canada
http://www.mining.ca/english

Ontario Mineral Development and Mine Rehabilitation
http://www.mndm.gov.on.ca/MNDM/MINES/MG/minrehab.htm

Ontario Ministry of Northern Development and Mines
http://www.mndm.gov.on.ca/MNDM/MINES/mmdhpge.htm

Quebec Ministère des Ressources Naturelles
http://www.mrn.gouv.qc.ca/1/intro.asp

CHILE

Chilean Copper Commission
www.cochilco.cl

National Service on Geology and Mining
www.sernageomin.cl

Expert Group on Mining GEMEED-APEC
www.gemeed.cl

IRELAND

Geological Survey of Ireland
http://www.gsi.ie

JAPAN

ECOW Virtual Center
http://ecow.mmaj.go.jp

Metal Mining Agency of Japan
http://www.mmaj.go.jp/mmaj_e/home.html

NAMIBIA

Geological Survey of Namibia
http://www.gsn.gov.na/

PAPUA NEW GUINEA

Department of Mineral Resources
http://www.mineral.gov.pg

PERU

Ministerio de Energía y Minas
http://www.mem.gob.pe

PHILIPPINES

Philippine Society of Mining Engineers
www.psem.ph

SOUTH AFRICA

Department of Minerals and Energy. Republic of South Africa
www.dme.gov.za

Geological Survey of South Africa
http://www.geoscience.org.za

UNITED STATES

Arizona Department of Mines & Mineral Resources
http://www.admmr.state.az.us

Arizona Mined Land Reclamation
http://www.asmi.state.az.us/reclamation.html

Bureau of Land Management, Department of the Interior
http://www.blm.gov/nhp/index.htm

California Department of Conservation: Minerals & Mining
http://www.consrv.ca.gov/smmm

California Department of Conservation: Office of Mine Reclamation
http://www.consrv.ca.gov/omr/index.htm

California Ecological Restoration Projects Inventory
http://ice.ucdavis.edu/CERPI

California State Mining and Geology Board
http://www.consrv.ca.gov/smgb

Colorado Department of Natural Resources: Mining
http://mining.state.co.us

Colorado Mining and Mine Safety, and Mined Land Reclamation
http://www.dnr.state.co.us/geology

Colorado School of Mines
http://www.mines.edu

Environmental Protection Agency
http://www.epa.gov

Mackay School of Mines
http://www.mackay.unr.edu

Mine Safety and Health Administration, U.S. Department of Labor
http://www.msha.gov/

National Association of Abandoned Mines Program
http://www.onenet.net/~naamlp/

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Nevada State. Commission on Mineral Resources, Division on Minerals
http://minerals.state.nv.us

Office of Surface Mining, Department of the Interior
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Surety Association of America
http://www.surety.org

University of Arizona Mining & Geological Engineering Department
http://tyrone.mge.arizona.edu

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