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Mining with communities

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Abstract

To be considered as sustainable, a mining community needs to adhere to the principles of ecological sustainability, economic vitality and social equity. These principles apply over a long time span, covering both the life of the mine and post-mining closure. The legacy left by a mine to the community after its closure is emerging as a significant aspect of its planning. Progress towards sustainability is made when value is added to a community with respect to these principles by the mining operation during its life cycle. This article presents a series of cases to demonstrate the diverse potential challenges to achieving a sustainable mining community. These case studies of both new and old mining communities are drawn mainly from Canada and from locations abroad where Canadian companies are now building mines. The article concludes by considering various approaches that can foster sustainable mining communities and the role of community consultation and capacity building. © 2001 United Nations. Published by Elsevier Science Ltd. All rights reserved.

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1. Introduction

Globally and domestically, the politics of mining are increasingly being played out at the local community level, monitored closely by a variety of media and non-governmental organizations around the world. Investors, insurance companies, banks, governments, and citizens increasingly want little to do with an industry that is seen as indifferent to the present and future socio-economic and biophysical welfare of local communities. This is a message that has been communicated loudly by international organizations, such as the International Council on Metals and the Environment (ICME) and the World Bank. Mining companies must now pursue their interests in a way that also promotes those of the local communities in regions where they are operating. The long-term sustainability and viability of both the mining industry and its related communities justifies serious attention. Improving environmental performance and mitigating environmental impacts of mining are

critical, but will not necessarily suffice to ensure the social health and welfare of associated communities.

It is necessary, therefore, to go further in considering what sustainability entails in the context of mining. Communications, education, cooperative decision-making and diversification are all important elements in long-term community sustainability. These concepts are not new. Yet, as illustrated by the following examples from around the world, translating stated goals into reality may not be easy. Nevertheless, certain initiatives in various locations are pointing to positive developments that can serve as models for a more sustainable future. To be effectively realized, such a future requires that there be a net improvement in the biophysical, social and economic health of the local community wherever mining takes place.

2. Sustainable mining communities

A mining community is one where the population is

significantly affected by a nearby mining operation. The community may be associated with the mining venture through direct employment or through environmental, social, economic or other impacts. The community can range in size from a city (which could be serving as a base for distant ‘fly-in fly-out’ operations, or a centre for supplies and financing) to a village (which relies extensively on local mining). Communities vary in their profile and perceptions about mining and needs. Their ongoing viability is also of considerable importance to mineral-producing countries. In Canada alone, there are 128 communities that rely on mining (NRCan, 1999) while others benefit indirectly.

Mining communities around the world share several common characteristics. Many older, well-established mining communities have faced reduced employment resulting from increased mechanization and automation or declining commodity prices. Mining companies are seeking economies of scale, and exploration and mining operations are moving offshore, as reserves become depleted. In developing economies, serious challenges arise from lack of economic security and stability, and from quality of life issues. Many mining communities are in remote regions with few opportunities for diversification. There are, therefore, numerous challenges to making a mining community viable.

A sustainable mining community is one that could realize a net benefit from the introduction of mining that lasts through the closure of the mine and beyond. In practice, this would mean that the community adhered to ‘three fundamental pre-requisites for sustainable societies’ outlined by George Francis (1999): ‘ecological sustainability, economic vitality, and social equity. As an ideal, sustainability meshes well with the desires of most people to achieve decent levels of health and well-being, in pleasant surroundings, with strong community networks, and a diversity of opportunities for work and fulfillment’.

The challenge for any mining company is to engage in an equitable partnership with the associated community and thus leave a lasting legacy of sustainability and well-being to the community, avoiding environmental degradation and social dislocation. Mining communities in different geographic locations may differ widely in terms of culture, political orientation, environmental characteristics and collective attitudes towards resource development. Nevertheless, communities that have had a poor relationship with a mining company tend to share certain common perceptions: that the mining operation is intruding into their environment, culture and history. Such a feeling may be particularly strong where there is no previous mining tradition and where benefits have not been cooperatively determined nor equitably shared. To minimize this perception and create a durable relationship is key to building a sustainable mining community. The following cases suggest that while mining companies are increasingly aware of this dimension and are taking initiatives, particularly in the

area of remediation, the industry still needs to develop further and address appropriate principles of sustainability.

3. Cases of company/community relations

A widespread public perception of mining is of a low-tech, polluting and avaricious industry. In 1994, a US opinion survey conducted by Roper Research, ranked the mining industry in 24th place in terms of public popularity, below the tobacco industry (Prager, 1997). Mining is seen as a hazardous activity, accompanied by acute environmental impacts. This view is perhaps strongest amongst urban dwellers who have little awareness of direct benefits from mining, despite being the largest consumers of its products. Rural communities may welcome mining activities as an alternative source of employment. Nevertheless, in all mining communities, residents are demanding recognition of their right to live in a healthy environment and to share the benefits. Recognition of the needs and rights of a community are now becoming entrenched principles in public decision-making throughout the world. As the global environment in which mining companies operate today is highly visible, they need to have a good reputation as being socially responsible. To achieve this, three fundamental considerations need to be heeded.

- Environmental impacts must not pose any unacceptable risk to associated communities;
- Communications between the mining company and the community must be transparent and effective; citizens should be encouraged to share in decisions that directly affect their futures; this will help mining companies avoid risks to the sustainability of both their own operations and the community;
- Mine development must be perceived to bring a net benefit to the community (it is no longer enough to simply mitigate impacts). To achieve this, community diversification must be part of mine planning, development, operation and post-closure.

The following three sections will offer examples of what can go wrong when these three essential aspects are overlooked. At the same time, some alternative examples will be offered that point to a more productive, holistic and cooperative relationship between mining companies and their host communities.

3.1. *The environmental impact of mining on communities*

3.1.1. *The Ok Tedi mine, Papua New Guinea*

A prominent example of adverse biophysical impacts has been the mining operation of Ok Tedi Mining Ltd. (OTML), which has been operating since 1984 in Papua New Guinea (PNG). It is owned by BHP Ltd (52%), the PNG Government (30%) and Inmet Mining Ltd (18%). BHP reported in

1999 that “Since the project began, it has not been able to construct planned tailings or waste rock storage facilities. As a consequence, these materials have been progressively discharged to the river system under government permit. During the reporting period, a total of 83 million tonnes of material entered the river system from the mining operation, of which 15 million tonnes was subsequently removed in the course of the dredging trial in the Lower Ok Tedi” (BHP, 1999). ENGOs¹ and community leaders have taken a strong and united stance against what they have termed one of the ‘world’s worst mining disasters’ (Mineral Policy Center, 1999a). They noted that these kinds of mining practice would not be allowed in Canada or Australia; as such they questioned why they were allowed in PNG (Friends of the Earth Canada, 1997; Minerals Council of Australia, 1999).

A recent OTML mine waste management project considered the possible means to reduce the mine’s environmental impact with engineering, social and environmental evaluations, including a risk assessment. It studied four options offering potential solutions, including closing the mine in 2000. It concluded that: “the issues are complex, and none of the options has identified a way to prevent mine waste causing environmental damage. For example, the studies show that the current projected environmental impacts on the river system exceed those previously expected; dredging will not have the environmental benefits originally expected and impacts on the river system will continue to worsen with or without dredging; and early closure of the mine appears to be the only option that will significantly limit projected environmental impacts. From a social perspective, it has been argued that early closure would stop the social and economic benefits that would accrue from continued operation and orderly closure in 2010” (BHP, 1999). Through the process, the communities have received employment, land rent, royalties and been provided with educational facilities as well as other community development projects. But are the tradeoffs acceptable? Must immediate improvements in the physical health of a community and employment come at the cost of long-term ecological degradation? Achieving a balance between ecological and social health can be a complex challenge, particularly in communities where there is little opportunity for economic diversification. The resolution of such conflicts will not be easy. Some governments anxious for revenues may encourage mining under unsustainable conditions or where it is difficult to find technical solutions to environmental problems. In such situations, it would be sensible to either await adequate technical solutions or pursue political or social alternatives.

¹ The ENGOs (environmental non-governmental organizations) include the Mineral Policy Center, MiningWatch Canada, Mineral Policy Institute, MineWatch UK, Calancan Bay Villagers Support Coalition, the Environmental Mining Council of British Columbia, Friends of the Earth, Pacific Environment and Resources Council, Project Underground, and others that endorsed the position of Pacific-based NGOs.

In addition to significant social benefits extended to communities, companies need to adopt integrated methods of environmental and social assessment.

3.1.2. *The Porgera mine, Papua New Guinea*

Another case in the Pacific region is that of the Porgera mine, also in Papua New Guinea. Operated by Placer Pacific since 1990, the mine has adopted a practice of mine waste disposal similar to that of Ok Tedi, discharging about 17,000 tonnes of tailings per day into a tributary of the Porgera River. Treated tailings and waste rock are discharged, predominantly as fines (80% – 0.065 mm). At a monitoring station 160 km downstream from the mine, the total concentration of heavy metals in water is very high but dissolved metals “do not exceed the PNG Government compliance criteria” (CSIRO, 1996). As the area close to the mine is scarcely inhabited and because the local population does not currently use the rivers for food and water, the mine management and independent consultants do not see health risks associated with riverine disposal practices. This view, however, does not take into account the potential for cumulative environmental impacts. Although multinational firms often claim that they apply the same environmental practices in less developed host countries as in their country of origin, this may not always be the case. Moreover, it is no longer considered satisfactory for mining companies to comply only with the environmental standards of the host country, which may often be less stringent, especially since the host country may be in urgent need of foreign investment. A number of NGO’s and other observers are keeping an eye on mining environmental standards.

Placer Dome is engaged in monitoring the environment and providing social benefits similar to those provided by BHP at the Ok Tedi mine. About 1900 people are directly employed and Porgera’s Community Affairs Department has developed a number of social and business programmes such as: professional training; business development; supermarket and bakery; community schooling and health services; sports; and youth and women’s assistance (Placer Dome Asia Pacific, 1998). Such important assistance is not easily given up by government and communities, despite long-term environmental implications. However, leaving responsible decision-making to governments or communities cannot be construed as encouraging community participation. Mining companies must take it upon themselves to adopt a precautionary approach, using their expertise to determine whether or not geological and other conditions warrant the environmentally safe development and closure of a mining operation on a certain property.

3.1.3. *The Island Copper mine, Canada*

In contrast to the Ok Tedi case, BHP took a more holistic, life-cycle management approach to its Island Copper mine on Vancouver Island, Canada. This mine was started in 1971 and closed in December 1995. It employed 900 people with an annual payroll of US\$ 25 million, producing copper,

gold, silver and rhenium. The mine's daily production of 50,000–60,000 tonnes of tailings was disposed over the ocean floor, 650 feet below sea level. The mine's economic contribution to the community and region was generated from its payroll, and additional spending on supplies and services of US\$1.5 billion over the 25-year life of the mine. The mine was instrumental in supplying physical infrastructure (power, water, building, dock and cleared land) for other commercial and industrial uses. The mining company also provided the community with a sewage treatment plant, 400 houses, support for a new hospital, an ice arena, swimming pool, theatre and parks. The flooded 530 acres, 1320 foot deep pit has subsequently been used for commercial production of Atlantic salmon smolt. A company has purchased the buildings and dock facilities for commercial production of crayfish and sturgeon. With almost half the population of Port Hardy directly dependent on Island Copper's payroll, most mine employees became actively involved in all aspects of community life. This helped to ensure that common goals were met. The company implemented two programmes to assist employees in job retraining and upgrading education. Other sustainable local initiatives were taken to create new business opportunities in tourism, wood and fish processing; and a seaplane base. The main lesson learned was that the personnel employed during the operation as well as the community should be involved in the closure process (Welchman and Aspinall, 2000).

3.2. *Communications, education and cooperative decision-making*

In developing countries, remote communities may not be prepared to change their lifestyles to accept new concepts of development if they perceive a loss of important cultural and spiritual values, even if their material standards are improved (McAllister et al., 1999). Community antagonism is often most intense when foreign exploration companies start working a site. Thomson and Joyce (1997)² have explored the complex relationship between the community and geological exploration companies. Having little or no knowledge of the larger picture of the mining industry and its competitive challenges, local communities quite naturally view an exploration company as an isolated occurrence. The level of expectation of a community does not usually coincide with the company's ability to invest. The community may perceive initial exploration drilling as if it is ore production. The expectation of jobs and benefits from the company may thus soon be frustrated.

3.2.1. *Cachoeira, Brazil*

An example from the village of Cachoeira do Piriá, in the state of Pará in the Brazilian Amazon illustrates the kind of

misunderstanding between a mining company and a community referred to above. This region experienced a significant gold rush from 1980 to 1990, with an influx of 10,000 people, including 5000 miners. A junior mining company, Brazilian International Goldfields (BGZ), headquartered in Vancouver, having secured an option to purchase two granted mining concessions at Cachoeira in September 1998, started an intense drilling programme (2200 m) conducted by Brazilian geologists. For the 2000 inhabitants of the recently created municipality of Cachoeira, the reactivation of the mining camp was a spark of hope. The camp had originally been created in the 1980s during the gold rush when about 5000 artisanal miners extracted almost 4 tonnes of gold from superficial ore. In the aftermath of mining and with few employment opportunities, the village is currently struggling. Most of the easily extractable soft ore has been depleted, and a handful of miners are producing minor quantities of gold by reprocessing tailings. The main economic activity of the village consists of sparse crops of rice, cattle farming and timber cutting and milling. Major international companies are exploring the Greenstone belt in the region in view of its potential for gold. The main geological targets lie at the periphery of the town, with 700,000 oz of gold defined to date. Prior to the BGZ's discussions with the Mayor of Cachoeira, there was a plan to build houses over old informal mining pits, shafts, audits and tailing sites left by the previous miners. BGZ reached an agreement with the Mayor to institute a moratorium regarding any further urban development within these areas until exploration was conclusive and to select alternative sites suitable for urban habitation. In order to establish a relationship with the community, the company employed over 20 people to assist in site preparation and geological sampling. Their salaries were 30–50% higher than the norms for that region of Brazil. After several months, the work was completed, the company turned to compiling the data, and most employees were laid off, as expected. Unfortunately, the local people at this stage lost hope in the possibility of a mining operation in the short term. They therefore ended the moratorium and again started building houses on mercury-contaminated tailings.

During BGZ's discussions with the Mayor of Cachoeira, the municipality and the community had openly supported mining, as they expected that it could bring long-term economic benefits. The prospect that BGZ would, for example, provide water to the town from the local Piriá River generated particular interest. However, the community wanted this to happen immediately. It had little understanding for the process and time required to establish a company-sponsored operation, including drilling and feasibility studies, which would have to precede any investment in infrastructure (Veiga, 1997). Drilling has recommenced on the Cachoeira property under a joint venture between BGZ and Gold Fields Limited, a major gold producer. Discussions with the community continue. Some artisanal

² Also published in PDAC Communiqué.

miners are still struggling to survive by extracting gold from tailings and small ore bodies on the property.

The behaviour of the people of Cachoeira is not atypical of the reaction of communities in remote areas when faced with foreign-owned mining operations that evidence no immediate benefits to them. In the case of Cachoeira, local people are not positive towards mining ventures, as they invade cattle farms, which are viewed as productive and associated with powerful local landowners. Foreign companies are seen as rich *gringos* with an obligation to provide jobs for all community members. The community does not know the difference between a major mining company and a junior. Even domestic companies from outside the region may be seen as intruders.

3.2.2. *The Yanacocha mine, Peru*

A recent incident in Peru also illustrates how difficult it is to establish a relationship of trust between a mining company and local communities, in particular a foreign company working in a developing country. Yanacocha mine, operated by an American company, Newmont Mining Corporation, is located in the Peruvian Andes at an altitude of 4500 m in the district of Cajamarca. The mine is the world's fourth largest gold producer (around 1.75 million oz in 2000), the largest Latin American gold producer and the largest heap leaching operation in the world. About 1.7 million oz of silver and 48 tonnes of mercury are produced annually through cyanidation, together with gold. On 2 June 2000, employees of a transportation company failed to observe that one of its 200-kg mercury flasks was not safely closed. An unsecured chlorine cylinder subsequently made impact with this flask, resulting in the release of 151 kg (or about 11.1 l) of metallic mercury along the 42 km road from the mine site to the coast, passing through small villages. Large pools of mercury were formed in the villages of Choropampa and San Juan, where the truck had stopped. Unfortunately, local inhabitants collected most of the spilled mercury, either to play with (in the case of children) or to extract gold and other metals they believed were associated with the mercury. Thus, a number of people, not knowing of its serious health hazards, handled the mercury or burned it in their homes expecting to extract precious metals (CAO, 2000). Fortunately, the company acted quickly to clean up the area and recovered most of the mercury from residents. Health and environmental consequences appear to have been minor.

Due to their general lack of education, and specifically their ignorance of the properties of mercury, local people were not able to respond appropriately to the situation. For example, it has been reported that when a local school teacher learned that the company was paying the equivalent of US\$ 35 per kg for mercury returned by residents (at least five times the normal price), he asked his students to collect and bring to him as much of the mineral as possible. In return, he would give the students better marks on their exams. As the teacher was not measuring the quantities of

mercury brought by the students, the children divided droplets and shared them with their peers so that all could get better marks. Fortunately, there were no registered cases of serious mercury intoxication, although some minor problems with dermatitis and red eyes did occur. This incident illustrates how the hazards inherent in mining-related activities can become a danger to the local community due to their lack of education.

No long-term effects are expected from this particular incident, as exposure to mercury was brief. Also, the risk of methylation (mercury being transformed to its most toxic form) is considered minor thanks to the environmental characteristics of the region, and the success of the clean-up efforts. At the time of the accident, local people were in the habit of using mercury for spiritual and medicinal purposes. Some believe that mercury has healing properties and it is frequently spread on the floor around people who are ill. It is important for a mining company to know of such local practices in order to be able to investigate possible misuse of dangerous contaminants. Misuse of mercury could result in chronic exposure to toxic vapours.

Health problems from mercury associated with mining are not limited to this accident. Historically in Peru, about 100,000–200,000 artisanal miners have been using mercury in gold extraction processes, undoubtedly handling it in rudimentary ways. This occupational exposure is a risk to the miners, their families, and other members of the surrounding communities, as well as the environment. An estimated 20–30 tonnes of mercury is released annually to the Peruvian environment, frequently under conditions conducive to methylation and bioaccumulation. The tragic conditions characterized by many artisanal mining areas are well known to Peruvians (Veiga, 1997), although very little has been done to address them.

Many lessons, both good and bad, can be learned from the experience of the Yanacocha mine. The company, through an established social development programme, has spent more than US\$13 million from 1994 to 2000 on assistance to local communities in health, education, agriculture, training, income generation, social and productive infrastructure, and rural organization. The company has sponsored four non-governmental organizations that have been conducting several social programmes for farmers, local women, the local university and schools, tourism in the Cajamarca region, etc.

In the case of the mercury spill, the company undertook an efficient clean-up. It is estimated that more than 90% of the spilled mercury was removed from the environment and from the hands of local people who had handled it. If the clean-up programme was successful, it came at a high cost to the company: US\$16 million. Also, it is believed that residents continue to withhold small amounts of mercury in the hope that the price will rise. The incident has also given rise to local speculation about the company's intentions. Some people believe that mercury contains gold, silver and uranium. An unfounded rumour has it that the

company deliberately dumped mercury on the roads so that it could buy houses in the villages cheaply, in order to acquire the thousands of tonnes of gold in the ground beneath. These instances all show that local mistrust of foreign companies can be a barrier to an effective and equitable mining operation. The mercury spill did not help foster a trusting relationship. The considerable financial compensation demanded by local citizens for the spill may possibly have been warranted but, ultimately, it may not have been the wisest use of community-directed money. The money spent on this small spill could have been used to create new economic opportunities in the towns, such as a sugar factory.

In hindsight, this company, as well as mining companies in general, would benefit from a closer communications strategy with the community in question, allowing it to make decisions based on a more thorough understanding of the benefits and risks of mine operations. In the event of any mine accident, the company could then quickly connect with the community representatives, inform them of the situation and ensure that the community properly understood what approach would be in the best interests of the community. In the case of the Yanacocha mine, the company will continue interacting with the various communities affected by the mercury spill incident. Monitoring will be conducted to ensure that remedial measures have been satisfactory. Health programmes will continue, while education in health and environmental awareness is scheduled. The company will also continue other community programmes such as schooling and medical services, as well as general infrastructure projects.

3.2.3. *Rio Tinto, Spain*

As mining companies evolve and move to new deposits and locations, they frequently lose their links with the communities that were originally central to their growth. For example Rio Tinto Zinc (RTZ), the world's largest private mining company operates over 60 mines and processing plants in 40 countries. In 1873, a group of English bankers and businessmen acquired the Rio Tinto mines from the Spanish Government for £3.8 million and founded the Rio Tinto Company Ltd, taking its name from the mining region in Southern Spain. The mines are located in the Pyritic Belt, a geological region that extends from Andalusia, Spain, to Southern Portugal. Tartessians, in 3000 B.C., were the first miners in the region and soon thereafter, the Romans extracted large quantities of gold and silver. The natural effect of bacterial leaching on massive pyrite bodies has been generating acid for millions of years and the natural impact is now mixed up with the drainage from over 200 mines, abandoned over the last 5000 years. The Tinto River is an encyclopedic example of acid drainage. With pH below 2, the Phoenicians used to call it the 'river of fire' and the Arab name for it was 'river of sulphuric acid' (Ariza, 1998). The region has recently been used by NASA

to test the performance of robots in acidic environments similar to those likely to be encountered on Mars.

By 1875, the Rio Tinto Company Ltd had become one of the world's largest copper producers, and was bringing significant wealth to the village of Rio Tinto, employing 14,000 people. A large public demonstration was organized in 1888 in the main municipal plaza of Rio Tinto to protest smoke and sulphur dioxide releases from the company's smelters. In order to control the crowd, the company asked the Spanish Army to intervene. The soldiers opened fire against the demonstrators, killing 200 people and wounding hundreds.

During more than a century of operation, the mine has changed names and witnessed several takeovers and mergers. In 1970, a new copper smelter was built in the city of Huelva, on the delta of the Tinto River. Today it is operated by Atlantic Copper S.A., a Freeport-McMoRan Copper & Gold Inc company in which RTZ has a 16% stake. The Huelva smelter is one of the world's largest copper smelters and is also very cost- and environmentally efficient (Atlantic Copper, 2000). In the 1980s, the Rio Tinto mine halted its copper production because of low metal prices, but the extraction of gold and silver from the ore maintained the profitability of the mine.

In April 1992, the Rio Tinto Foundation inaugurated a Mining Museum that became an embryo of a series of initiatives to restore the historic mining sites of the region. These include drifts and caves left by the Romans, old railroad tracks and locomotives, ruins of the old processing and roasting plants, etc. These sites are visited by over 40,000 people every year and bring important income to the Rio Tinto community that is proud of its mining history. The restoration work on the mining sites, tools and transportation equipment has been a remarkable example that could be emulated in other countries. Despite the environmental damage arising from the excess of pyrite in the environment, the community has taken advantage of this phenomenon to sell souvenir bottles of acidic water.

In 1993, the US based company, Freeport, acquired 100% of the mining rights and copper smelter. In 1995, the mine operation was sold for a symbolic price of 1 peseta per share to the mining employees. The new mining company, Minas de Rio Tinto S.A.L., is being formed by 523 workers who are waiting for a US\$5.7 million loan from the Spanish Government to initiate the exploitation of a rich copper orebody. The forecast for economic return is not very optimistic, however and the new owners are considering selling the mine.

The community of Rio Tinto, with 5100 inhabitants, suffered from a lack of economic alternatives after Freeport-RTZ transferred the mine operation to local employees. The only recent productive activities in the town are small factories making cardboard and plastic packaging. The future of the Minas de Rio Tinto does not seem to be promising, as sparse efforts from a few employees to extract copper and gold from old workings have met with limited success.

In a recent workshop in La Rabida (CYTED, 2000), Spain, employees from Minas de Rio Tinto and community members raised the question why RTZ gives donations of millions of dollars to the Royal Museum in London but does not help them exploit more value from their mine. Company representatives were not present to answer.

Around the world, RTZ has actively participated in several initiatives with communities near their mines. In its homepage (Rio Tinto, 2000), it states that “we recognize our business can accelerate social change, and we accept the obligation to work with our neighbours to manage that change.” The company has also played an important role in the recently created Global Mining Initiative, a forum where representatives from governments, educational institutions, businesses, communities and non-governmental organizations aim to ensure that the mining industry contributes to the global transition to more sustainable patterns of economic development.

As a multinational mining company, RTZ has faced strong opposition to its operations around the world, including, for example, from a United Kingdom-based NGO called the PARTIZANS (People Against RTZ and its Subsidiaries). Since 1991, this NGO has published extensive material reporting how Aboriginal communities in Australia, USA and Canada, as well as residents of the Philippines, New Zealand, U.K., Panama, Namibia, Zimbabwe and other countries, are being threatened by RTZ mining operations. The NGO believes that “... mining, by its very nature, constitutes an assault on the physical, social and cultural environment” (Gedicks, 1991). It is interesting to note that the community in Rio Tinto, Spain, does not appear to have heard about this NGO and there is no citation about the village in the NGO’s publications. It seems that both the mining company and its opponents have forgotten the community of Rio Tinto. Agricultural prospects are poor in the region and the possibilities for reviving the glory days of mining are remote. As in Manitoba, tourism is being considered to help fill the void of economic activity. Unfortunately, even tourism, with very little support and investment, may only be able to attract tourists who wish to witness the effects of environmental degradation from mining.

3.3. The need for alternatives and community diversification

As noted in the cases above, the reaction of a community to a mining operation in its vicinity may be volatile and unpredictable, particularly when the level of poverty is high and mining is a potentially strong economic activity. This is a serious problem for sustainability, particularly when one considers the huge numbers of people dependent on marginal forms of mining employment. In 1993, for example, it was estimated that about six million of the world’s 30 million mine workers were engaged in artisanal operations in more than 40 countries, extracting over 30 different types of mineral substances (Noetstaller, 1995).

The International Labour Organisation (ILO, 1999) estimates that the number of artisanal miners is currently around 13 million in 55 countries and rising, which indicates that some 80–100 million people worldwide may depend on this activity as a livelihood. Gold, due to its ease of trading and independence of monetary instability, is by far the major commodity being extracted. Experts have estimated that one in every 900 Latin Americans are employed in gold and silver artisanal mining (Inter Press Service, 1995). Some countries are facing severe social and environmental problems from poor mining and processing practices associated with a lack of economic alternatives (Veiga, 1997).

It is perhaps difficult for developed countries to grasp the scope and scale of the artisanal mining problem in developing countries. Concepts such as conservation, heritage values and aesthetics, that are commonly established principles in developed countries, are superseded by the struggle for survival and need of employment in poorer countries where choices are few and people are unable to plan beyond the immediate future. In December 1999, the World Trade Organisation meeting in Seattle brought to the public’s attention many important points related to the fragility of developing countries in establishing their trade protocols. It has been estimated that, in developing countries, some 250 million children between the ages of 5 and 14 work, half of them full time, and tens of millions of them under exploitative and harmful conditions. In some countries, 250,000 or more children work full-time or part-time in artisanal mining operations (Jennings, 1999). Most children work to support their families. Their parents are aware of the hazards and risks associated with rudimentary mining activities but see no alternative. In some cases, this is the way to keep the families together. Jennings (1999) reports that the main reasons for child labour in small-scale mining are: poverty, lack of incentives to go to school, no prospects for regular employment, lack of coordinated policies to stop child labour, lack of enforcement, a reluctance to invest in small-scale mining to improve performance and social benefits for rural communities. Governments and mining companies all over the world are generally not well prepared to deal with artisanal mining issues, let alone those related to child labour in marginal or illegal activities. The World Trade Organisation meetings also highlighted another important point: many powerful and vocal organizations are no longer prepared to allow trade and development to take place without equal attention being paid to such adverse social (and environmental) impacts.

The conservative tradition of rural politics in developing countries also poses a considerable obstacle to the creation of an environment of trust between governments and miners. Many governments impose rules on artisanal miners trying to force them to be part of the formal economy. Rarely is assistance provided to help these miners use legally and technically sound practices. Cultural, social and political constraints are barriers to meaningful consultation with stakeholders and to developing a consensus

approach to common concerns. These problems are part of the historical legacy of developing countries (Peiter et al., 2000).

3.3.1. *Las Cristinas, Venezuela*

One of the most interesting projects in communities with a traditional history of artisanal mining has been evolving in the interior of Venezuela: a venture to extract 48,000 tonnes of gold ore daily from the Las Cristinas deposit. Placer Dome Ltd. faced significant social tension when they became a partner with a Venezuelan public company in 1994 to develop the project. The community of 2800 people, mostly artisanal miners and families, had already suffered significant economic destabilisation from the relocation to new settlements outside the property in 1992. Unauthorized mining became a potential problem, especially as it represented the livelihood for 40% of the active population. With the escalation of tension in the area, the company proposed a co-habitation programme, establishing a small-scale mining operation within the company's property with the participation of the local community. The company invested US\$ 1 million in this project to foster a stable relationship with the community. After an extensive effort to organize the miners and provide a legal framework for the operation, a training programme focused on the introduction of safety and environmental considerations and the improvement of quality of life. A mining centre was created in 1997 including: a recreational area, cooking facilities and an infirmary. Mercury was banned from the property, and in 1999 the independent work of 200 miners changed to a more cooperative organisation with 50 miners receiving salaries and establishing production goals. About 2 kg of gold was being produced per month under the management of a miner's association (Davidson, 1998). Unfortunately, the co-habitation solution has only involved a small number of people as it does not yet provide economic diversity during and after mine closure. The efforts at this mine should be carefully examined, as community participation was seen as an important and viable approach to contemporary mining practices. Moreover, it became clear that social instability and discontent (an important factor in political risk assessment) can play a far greater role in determining the ultimate success of a mining operation than had been historically calculated in mineral investment decisions.

3.3.2. *Mining communities in Manitoba, Canada*

Sustainability of mining communities is not just an issue in developing countries, it is a worldwide problem. One example of a very successful, proactive approach to partnerships and long-term sustainability is found in Manitoba, Canada, mining being the second largest primary resource industry in the province. Unlike the cases from developing countries discussed above, mining has a long and respected tradition in Manitoba. Communities have been built around the mineral industry and there is a generally supportive local culture for mining activities.

Building on an earlier national multi-stakeholder process entitled the Whitehorse Mining Initiative (The WMI Leadership Council, 1994), interested parties in Manitoba have been working together to develop a strategy for long-term sustainability. In early 2000, the Manitoba Minerals Guideline, a code of practice, was signed by five parties: First Nations, Metis Nation, Northern Community Councils, the Minerals Industry and the Province of Manitoba. These parties are working together to develop an approach to mining that considers the many needs of all affected parties. Efforts are being made to improve educational and business opportunities, joint ventures, cross-cultural training, and maintaining diverse ecosystems (Manitoba Minerals Guideline, 2000).³

In Northern Manitoba, five traditional mining communities, who have faced mine closure and loss of economic opportunities, have joined forces to build on their mining base to develop a sustainable plan for the future. Calling themselves, Team Manitoba, a group of small, isolated communities, Flin Flon, Lynn Lake, Leaf Rapids, Thompson, and Snow Lake, are developing strategies for the future (Team Manitoba, 2000). These small towns, with populations ranging between 1000 and 15,000 inhabitants, decided to work together to attract investment in exploration and mineral-related activities by advertising their potential mineral wealth and the province's favourable investment climate. They are also banding together to advertise their communities as part of a region that can serve as a regional tourist destination, to encourage visitors to explore the history of the mining communities and operations, to engage in sports as fishing, hunting, canoeing, cross country skiing, and ecotourism, to learn about aboriginal cultures, and to participate in festivals.

Other initiatives are also underway. An abandoned part of one mine will be used to legally grow marijuana for medical purposes, and the growing of herbs and vegetables hydroponically is being considered. In Thompson, Manitoba, cold weather testing of equipment such as snowmobiles and trucks, offers another economic opportunity (Bloodworth, 2000).⁴ Beyond economic development, however, as part of the overall strategy of the province, a level of stability, essential to both long-term community development and ecosystem integrity, is being established through ongoing consultations amongst diverse stakeholders to set up a network of protected areas. Working closely together, groups such as the World Wildlife Fund Canada (WWF), the Mining Association of Manitoba and the provincial government have achieved a remarkable level of consensus regarding protected areas using the Whitehorse Mining Initiative recommendations. Sophisticated mapping tools are used to avoid conflicts between proposed protected areas with important representative ecological features and

³ See also Prospectors and Developers Association of Canada, PDAC (2000).

⁴ See also Globe and Mail (2000).

areas known to have a high mineral potential. This approach has met with considerable success and similar consultation is taking place with forestry, Aboriginal and hydro interest groups. The degree of cooperation, particularly that which has been achieved between the Manitoba Association of Mining and the World Wildlife Fund is unusual in Canada and elsewhere in the world. For the industry, communities and governments wishing to maintain stability and ecosystem integrity, the initiatives in Manitoba warrant closer scrutiny than space here permits.

4. Sustaining the community

Today, any mining company that has experienced poor community relations knows that sustaining the community is integral to an effective and respected operation. As noted earlier, a sustainable mining community should be based on the principles of ecological sustainability, economic vitality, and social equity. An examination of case studies shows a wide variation in circumstances and approaches.

The traditional route to a sustainable mining community has tended to focus on a three-step approach. The first step was to establish infrastructure to support and nurture the workforce. Mining companies in Canada, for example, have set high standards in creating towns and infrastructure, including utilities and medical and educational facilities. Canadian mining towns built in remote areas over the past 25 years or so probably belong to the last generation of such endeavours, including Leaf Rapids (Manitoba), Fermont (Québec), Elliot Lake (Ontario), and Tumbler Ridge (British Columbia). Some communities that grew up within such towns and infrastructure have evolved further through diversification: Sudbury (Ontario), for example, has grown into a city with a diverse industrial base. This growth has been facilitated by the city's geographical position as a transportation centre, the continued presence and collaboration of two major mining companies for over a century (INCO and Falconbridge), favourable government initiatives and an active local community. Part of Sudbury's vision for development is to become a world leader in mining technology and services, and to set up a global fibre optics network. Sudbury is promoting an Internet-based initiative to make the region's expertise and resources available to the international mining community (Sudbury Regional Development Corporation, 2000). Sudbury has been fortunate to see a large number of mines, as well as smelting, refining and other downstream activities. All mining communities eventually will witness the exhaustion of their mineral deposits and the closure of their mines. In an earlier generation of mining communities, little thought was given to sustainability and many suffered and wilted after the closure of the mine. Although people were often willing to respond to change and the need to follow the new sources of ore elsewhere, significant social damage was generated when the mining company moved away.

The second step was to generate sustained employment through discovering and mining all available ore deposits in the locale. Communities such as Flin Flon and Snow Lake (Manitoba), for example, have been sustained remarkably well by the continued discovery and operation of many ore deposits within reasonable proximity.

The third step generally was to leave infrastructure such as roads, power, and housing to local communities when the mine was closed or, in remote areas, to demolish it. Planning for mine closure is a relatively recent development and its scope and practice are still evolving. In the past, infrastructure was viewed by many companies as a major contribution to the communities. While the hard infrastructure remained, social and environmental responsibilities were left to the government. Experience has shown, however, that bricks and mortar are no substitute for enlightenment, education and organization. Villages left behind by mining companies often became shanty towns, as the Amazon region has demonstrated. Today, in both developed and developing economies, the approach to creating a sustainable mining community has changed. It is now required to contribute to the ecological integrity or viability of the local biophysical environment, to diversify the economy into different areas, and to consider long-term community sustainability.

As the market price for mineral and metal commodities fluctuates, mining communities go through periods of economic downturn, which challenge their viability. Mines that are built during periods of high prices may decline and close with the onset of market downturns. The decline of coal prices in the last two decades, for example, has had a severe impact on the coal mining communities and led to a number of closures. A dramatic decline in Europe's coal mining industries was followed in North America. Governments frequently find it difficult not to intervene and provide subsidies to workers and communities through such difficult periods. In Canada, recent closure victims have been coal mines in Cape Breton, Alberta and North East British Columbia. In Cape Breton it has been estimated that the total government subsidy of the coal mining industry since 1968 has been around \$1.7 billion. Some would argue that this has had negative effects on affected mining communities, such as discouraging innovation, entrepreneurship and self-reliance (Campbell, 1999).

Two coal mines were built in North East British Columbia, the Quintette and Bullmoose mines, as part of a Canadian mega project in the 1980s. A total of \$2.6 billion, more than half being taxpayer's money, was invested in port facilities, hydro and rail lines and other infrastructure. Between 1981 and 1983, a new town was created solely to serve the mines. The population of Tumbler Ridge peaked in the early 1980's at 5000, falling to about 2500 in March 2000, when it was announced that the two mines would close earlier than originally planned (Culbert et al., 2000). The challenge for this remote, northern community is to transform itself quickly from being based on one industry, and diversify. Options include new oil and gas developments and a

sawmill; another option is for the town to become a retirement community.

The advent of long-distance commuting (LDC) or ‘fly-in fly-out’ as a model for mine development has added a further dimension to planning for sustainable mining communities. In long-distance operations, remote deposits are mined without building a traditional mining town. This method may bring its own set of implications for rural and remote communities, particularly if that community has no previous experience with mine employment. Of great concern to declining mining communities is the prospect of being ‘flown-over’ as companies may prefer to hire staff from larger regional centres rather than from the smaller, more remote towns. On the other hand, LDC operations can be far less environmentally disruptive than to build a new mining town. Significant environmental (socio-economic and biophysical) costs accompany the building of a mining community, especially considering its requirements for extensive infrastructure, schools, and social and health facilities required in a remote setting. An LDC operation can avoid many of these costs. The opportunities and costs, both for the company and the affected mining towns, need to be carefully weighed and evaluated case by case. In developing countries, communities may be reluctant to use LDC rather than hire local workers. Placer Pacific’s Porgera mine (Papua New Guinea), for example, was originally intended to be operated on a fly-in, fly-out basis. However, this idea appears to have been dropped at the request of the government (Mining Journal, 1989). In contrast, many say that Tumbler Ridge will be the last mining community to be built in Canada as there does not appear to be general public support for such ventures. Instead, LDC has been used in recent times for remote areas, such as the Raglan Mine in Quebec or the Ekati Mine in the Northwest Territories.

The attention of mining companies to the surrounding social environment has historically been devoted to the reduction of conflicts or compliance with legal requirements rather than its long-term sustainability. Sassoon (1999) highlights the importance of a serious environmental (and social) impact assessment (EIA) to constitute a commitment for companies to establish environmental management, not merely to pay lip service to legislation. Community consultation is increasingly being practiced throughout the world. Consultation has been an intrinsic part of environmental impact assessment in many countries as guidelines for companies to interact effectively with communities. Basic strategies are offered by social scientists to reduce the difficulties that companies have when dealing with the public (Connor, 1997). The community needs to fully understand the mining project and its costs and benefits, and consultation can help involve it in a joint problem-solving process. From the community’s perspective, such consultation can lead to a far better understanding of the proposals covered in the EIA and can contribute to a successful working partnership (Australian Environmental Protection Agency, 1995).

5. Community consultation and capacity building

Consultation can make the life of a mining company somewhat easier but it will not in itself achieve community sustainability. What is being suggested here is a more significant, fundamental change: one that is related to questions of power, resources, and control. Resource-based communities throughout the world, including those in Canada, have historically been at the mercy of events happening and decisions taken outside their control; whether it be fluctuating world market prices, foreign-owned companies, international trade organizations, or domestic governments—primarily serving the interests of the politically influential urban and metropolitan regions. At the heart of the problem then is a question of social equity. Until community members themselves feel that they are partners in decisions that intimately affect their own lives and the environment in which they live, little progress on the path to sustainability will be achieved. As some analysts have pointed out, what is required is ‘resilience through local governance’ (Paget and Walliser, 1983). A flexible, adaptable local process is needed, where communities can ‘withstand the periodic or sporadic economic misfortune that besets all resource communities at some point in time’. Rather than having companies or state governments determine the future and structure of communities, a system of local governance needs to be established. Such a system of local governance should include all community groups and actors, not just local politicians. Such participation should take place before, during and after mine development. Warhurst et al. (1999) have stressed that the socio-economic impact assessment needs to be an ongoing process throughout the active life of the mine and through decommissioning. The authors suggest that the consultation process needs to change from an almost exclusive focus on the operational phase of a mine to placing equal emphasis on exploration and closure. Such a pro-active approach would reduce false expectations on the part of the community during the exploration phase and would also mitigate the impact of closure. The problems of coping with closure at the community level range from unemployment and family disruption to destruction of the environment and consequent loss of economic opportunities.

The first step to community sustainability, then, may relate to local capacity-building and local governance. Community members are given choices as to how the mine can be developed, and as to tradeoffs that are possible within existing financial, social and natural constraints. Developing a sense of control within the community leads to political, local and social stability. Paget and Walliser (1983) suggest that through local governance it is possible to:

- embrace and foster a broader concept of community governance;
- elevate social development to a position of at least equal prominence with other development objectives; and

- actively involve local residents in the process of making decisions for themselves.

With these internal capacities, communities will be better able to respond to rapid economic change, face an uncertain future, and will have increased long-term resilience to conditions generated by external forces beyond their control (Paget and Walliser, 1983). Companies would also benefit from this approach. Rather than having to face unrealistic expectations, they would be able to work with a consistent local policy that outlines clearly what it needs and what can be realistically expected from the mining company. Without a measure of local empowerment, communities are placed in a position of ignorance, mistrust and inability to negotiate effectively.

6. Adding value to the community

The benefits a community can gain from a mine being developed in accordance with the principles of sustainability include the opportunity to diversify their economy and add value to the area. Values may include the enhanced benefits mining companies traditionally consider, such as: direct employment; ancillary economic activity; water and power supply; transportation and other infrastructure; education, health and other facilities as discussed above.

However, companies need to think beyond that, about how the development of a new mine could bring long-term biophysical and socio-economic improvement to a region in a way that is consistent with holistic principles of sustainability. This means that, to be sustainable, a decision should not result in a zero-sum equation where there is a dramatic trade off between immediate needs and long-term ecological integrity. As demonstrated by the case studies discussed in the foregoing, the issues and solutions are often complex. They will require attention at the level of international trade organizations and decision-making bodies; they will involve financial institutions, governments, non-governmental organizations, and mining associations. It is often at the international level that preconditions for local sustainability are established. Given current concerns over recent failures of tailings dams, mining companies will need to establish their credibility regarding the design and management of waste disposal systems. Instituting mechanisms for independent environmental audits and independent environmental reporting would go a long way toward convincing communities and ENGOs that a company is committed to environmental sustainability (Mineral Policy Center, 1999b).

It is not suggested here that the quest for a sustainable community is easy. An important first step is to define a general goal. For example, a fundamental decision-making principle for the development of any sustainable mining community might be the following: does the mining company operate on an ethical basis in a way that contributes to the well-being of the present community and leaves a sustainable legacy for future generations? In the words of

George Francis (1999), “sustainability is ultimately an ethical commitment based on a belief that the natural world and its component life forms, including humanity, have value in and for themselves”.

7. Conclusion

The global mining industry is facing many challenges in terms of human interaction with physical and social environments. Many companies have invested considerable resources in technological innovation to increase productivity and competitiveness. Benefits also relate to improved health and safety, as well as the quality of the environment. Attention still needs to be given to finding innovative approaches to establishing long-term benefits for the communities created or enhanced by the presence of the mining operation. Developing resilient communities, long-term benefits, and shared decision-making processes may not come easily to mining companies but experience indicates that the diverse needs and requirements of communities must be acknowledged and respected. Such an approach recognizes that community sustainability is not simply another management problem, something that needs resolving much in the way that a technical difficulty might be tackled. It is a completely different philosophy based on a concept of sharing benefits and responsibilities with local communities. This is a philosophy that goes beyond mere coexistence; it is one that promotes concepts of industry-community co-participation in the mine-building process. As Canadian mining companies are moving to developing regions it is of paramount importance to understand how the problems of poverty and disenfranchisement affect the long-term health of a mining community. Built into that understanding is a recognition that local people need to make decisions about what benefits they would like to see, that will fit in with their cultural needs and physical requirements. Thus, there is no single formula. Adaptability, flexibility, responsiveness, and respect for people and the biophysical environment, which we all depend on, are the principles upon which future mines need to be built if they are to follow a more sustainable path.

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