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FADEMIN

Foundation for the Assistance and Development of Small Mining A New Body to Promote Small-Scale Mining in Bolivia

Introduction

The Bolivian mining industry is emerging from a 40-year period of stagnation, a period when no new deposits were discovered, and when modernization was insignificant. The principal causes of stagnation were the existence of an out of date mining code, a mistaken tax policy and the lack of an adequate plan for systematic exploration (Arce, 1978).

Several measures are now being adopted by the Bolivian Government to re-vitalize its ailing mining industry. These measures include a new mining investment code that aims to attract foreign and domestic private investment, improvement of the system for the application and registration of mining claims and opening of highly prospective, previously restricted areas.

As part of the re-vitalization effort the Foundation for the Assistance and Development of Small Mining - FADEMIN, was created. While the initiative to establish an organization whose sole objective is to assist the development of the small-scale mining sector comes from both government (Ministry of Mining and Metallurgy) and non-government bodies (National Chamber of Small Mines), the Foundation itself will operate as a private, non-government organization.

The Small-Scale Mining Sector in Bolivia

The small-scale mining sector has

been an important employer and significant contributor to the country's export earnings. Due to the difficulty of collecting accurate statistics, its contribution to the economy is generally underestimated. The sector consists of "Mineria Chica", small mines that are characterized by a low degree of capitalization or mechanization, and "Cooperativas", cooperatives of miners that work more or less independently on the same claim. The mining cooperatives first appeared in the 1950s as a result of unemployment in the mining centres.

Within the Minería Chica, some 85% of the operations, according to one estimate, are "marginal small mines", for which the operator has historically had no access to financing facilities, nor assets to act as a guarantee for credit. These mines generally operate without adequate technical direction and without proper mine preparation. Their main objective is to extract ore, concentrate it using manual methods, and sell their concentrate to private traders, medium-scale mining operations, or the Banco Minera (BAMIN - the Mining Bank of Bolivia), in order to continue mining.

BAMIN was originally set up by the Bolivian Government to purchase the small miners production, market ore, and to aid the small-scale mining sector through credits and machinery. However, BAMIN proved to be overly bureaucratic and inefficient. Providing credit to approximately 5%

of the miners seeking financial assistance, it was criticized as being a "little" selective in its distribution of credits. Some three years ago BAMIN was unable to purchase all the small miners production offered to it. Today BAMIN continues to operate, buying some concentrates and selling mining equipment. Discussions are currently underway to determine BAMIN's future and whether it should be privatized, restructured, or permanently closed.

In 1976, approximately 6 800 small-scale mining operations were selling to BAMIN. Now it is estimated that only 1 000 small scale mines are in operation. This decline in operating small-scale mines was part of an industry wide collapse in the early 1980s in Bolivia. It was due to the dependence of the Bolivian mining industry on a few "traditionally" mined minerals, most notably tin, the price of which dropped significantly, and disastrous government marketing regulations between 1982 and 1985 that resulted in an indirect tax of 90%+ on mineral exports.

Many of the small miners that are not producing, still hold on to their claims (by paying an annual mineral patent fee) in hope of a better economic climate, better commodity prices and the government's assistance. The result is that a significant amount of highly prospective ground is in the hands of small miners who do not have the ability to properly explore or exploit their ground.

While they are unable to work their mines, most of the miners work in informal business (street trading), the coca industry, other agricultural work, smuggling, and gold panning in the Altiplano and Amazon regions of the country. Many would be considered unemployed.

FADEMIM

The current state of decline of the Bolivian mining industry has led to some major restructuring efforts by the government and the industry. However, most government actions to date have focussed on the large to medium scale mining operations. FADEMIM will be the body through which the small-scale mining sectors needs are addressed.

The primary objective of FADEMIM is to provide financial and technical assistance to the small-scale mining sector (Mineria Chica and Cooperativas), focussing on the "marginal small miners". It is hoped, that with FADEMIM's assistance many miners will return to mining, augment mineral production and at the same time, improve their living standards.

At this stage, FADEMIM is just being organized and its statutes are in the process of being approved. The following account of FADEMIM's proposed structure and function comes from information supplied by the Ministry of Mining and Metallurgy and the National Chamber of Small Mines (CNMC).

Organizational Structure

FADEMIM is to be a private, non-government organization. Strong concern has been voiced that if it were to become a government agency it would suffer from the same problems as BAMIN.

First a Board of Directors will be formed with representatives from the Ministry of Mining and Metallurgy, the National Chamber of Small Mines, the Federation of Cooperative Mines, The UNDP and other organizations providing funds or other forms of assistance. It is envisaged that FADEMIM will be the organization through which all funds aimed at aiding the small-scale mining sector will be channelled. Then the executive body will be formed with advisors from various agencies, both national and international.

FADEMIM will have four basic departments or areas of activity:

1) financial, seeking and providing

credit;

2) technical, providing technical services;

3) administrative, administering the operations of FADEMIM;

4) environmental, control and social assistance conducted through or in conjunction with other specialized agencies.

Funding

Start up and capital equipment grants will be sought from a variety of international granting agencies, including the Japanese, German, and Canadian governments; technical and supervisory assistance from the UNDTCD; offices, local operating costs and organizational assistance from the Ministry of Mining and Metallurgy and Bolivia's Social Investment Fund.

Technical Assistance

Technical services will be provided through technical groups located in the major mining districts. The technical groups will consist of a geologist, mining engineer, metallurgist and administrative/cost control advisor. There may be several technical groups per district. The operations of the technical groups will be supervised by a central group of experts from the UNDP, who will provide training and technical guidance.

The initial task for the technical groups will be to make an inventory of mines; priorities will then be set for giving assistance. The mines that are in a position to start production or to significantly increase production immediately will receive assistance first.

In the process of making the inventory, on site recommendations will be made to the mine operators and requirements for improved operation identified. These requirements will mainly be equipment (hand tools, machinery, etc.) or working capital related. While most equipment supplied will be manual tools, semi-mechanization will be supported when justified by the deposit's potential.

A better understanding of the ore-body, a safer working environment, efficient and environmentally considerate mining practices and improved administrative methods will also be promoted.

Domestic Suppliers

The tools for the small-scale miners, e.g. wheel barrows, shovels, picks,

manual crushing equipment, shaking tables, screens, pumps, etc., will mainly come from domestic suppliers. These suppliers will be given assistance to improve the quality of their equipment and meet increased demand.

Machinery Pool

FADEMIM will assist miners to expand production by providing the services of a machinery pool. The machinery would be operated through FADEMIM's technical department. This would allow some mines to expand production without going into debt. Machinery pool services and studies carried out on mining properties would be a cost against future production, based on real costs with no profit.

Regional Processing Facilities

In some regions, where there is a high concentration of mines, processing facilities may be constructed in order to improve milling recoveries and increase the quality/marketability of the mines products.

Investment Promotion and Marketing Assistance

Where resources may be more profitably exploited at a larger scale, for example by joining several claims, FADEMIM would seek partners with the appropriate financial resources to develop a larger scale operation.

While FADEMIM will not act as a buyer, like BAMIN, it will assist the small miners to find the best deal in the market place for their production (possibly by taking tenders from buyers).

Diversification of Small-Scale Mining

FADEMIM's efforts will not be successful if they only promote the production of traditionally mined minerals like tin, silver, antimony, tungsten, zinc, and lead. Therefore, FADEMIM aims to promote exploration for and mining of other minerals which can be exploited successfully at a small scale, including non-metallic and industrial minerals. The potential for this diversification is significant as Bolivia has large untapped reserves of these non-traditional commodities.

FADEMIM - continued on page 12

JOHN CARMAN — A MEMORIAL TRIBUTE



Dr. John Carman, the "founding father" of UN mining and geological activities, a long-time member of AGID, and the force behind SMI, died at home in Toronto on March 19 at the age of 75.

A graduate of what is now Michigan Technological University, John Carman completed his training as a mining engineer with a Ph.D. in mineral economics from Columbia University after serving five years in the Royal Canadian Engineers during World War II. In the 1950s, he worked as a mine superintendent, a mineral economist with the Canadian Government, and an executive of a uranium mining company. During this period he also undertook assignments for the UN in Bolivia and for the Colombo Plan in India, and evaluated mining properties in several other countries.

In 1958, Dr. Carman became the first minerals specialist to be employed by the United Nations Special Fund. He surveyed the mining requirements of many countries, particularly in South America where he was resident in Chile and Argentina. He was responsible for developing an important global role for the UN through the successor to the Special Fund - the Department of Technical Cooperation for Development - which now has annual portfolio of about \$20 million in mining and geological

activities. He played a key part in setting up the UN Revolving Fund for Natural Resources Exploration and became its first Technical Manager in 1975. Following his retirement from the UN at the end of 1976, Dr. Carman continued to take on assignments all over the world for the UN, as well as the World Bank and the InterAmerican Development Bank.

Dr. Carman's contributions to mineral development programs in the Third World were recognized and appreciated by client countries and mining professionals everywhere. An eloquent speaker and imaginative "conceptual" thinker, he had the marvellous gift of being able to cut through the "red tape" and organizational complexities to grasp the essentials of a situation. He also had a very special ability to communicate with people in all walks of life. Who else would understand the hours of boredom suffered by the operators of the UN's Secretary-General elevator and without fail provide them with small gifts every Christmas?

John Carman wrote in a brilliant and unmistakable style - provocative, concise and full of humour. Long hours of pre-dawn commuting and his highly audible one-finger typing led to the assemblage and editing of an authoritative Survey of World Iron Ore Resources published by the UN in 1970. Many of his essays on developing countries were collected in a book Obstacles to Mineral Development: A Pragmatic View published by Pergamon in 1979. Anyone interested in the financial, human and organizational problems that face mineral developments in the Third World should read and re-read this classic analysis and commentary.

Dr. Carman was an outspoken participant in the 1972 Montreal Geological Congress symposium on geological aid to developing countries, where the idea of some kind of continuing forum on geoscience in development was first mooted. He was rather caustic at the idea that a collection of individuals, such as present there, could make any effect on the disorganized, inefficient and uncooperative state of the technical assistance business. He was

certainly critical of the idea of setting up yet another organisation and bureaucracy.

Yet when AGID formed a few years later to link geologists, mining engineers, geophysicists and other earth scientists in the interests of developing countries, he was among the first to join. Later in retirement, his collaboration with Mike Woakes resulted in the publication of AGID's popular 1983 Guide to Mineral Resources Development. In the final years of his life, although not in good health, he took on the unrewarding task of coordinating the book and journal recycling scheme that AGID sponsors in Canada.

John Carman was particularly fascinated with the problems and prospects of the small-scale mines, and many of his best writings were devoted to this topic. He edited with R.F. Meyer, the proceedings of the UN Conference on Small-Scale Mining held in Mexico in 1978. When approached by an AGID Councillor in 1984 on how to make the Association more self-sufficient, John quickly saw an opportunity to utilize AGID's unique network of geoscientists to provide badly needed information to local small miners, governments and the international mining industry. Indeed, his ideas and support were critical to the recent establishment of Small Mining International, which is now working to realize John's vision for the benefit of the small miners who were so close to his heart.

Those who knew John Carman will never forget his wonderful and picturesque tales of geological adventures, of wanderings in the Altiplano of Bolivia, of scavenging to survive D-Day landings of World War II and of the liberation of Holland, or of his sometimes unrepeatable tales of strange people in strange places. In the Delegate's Lounge at the UN, in wayside bars in many countries, in the offices of small mining enterprises around the world, his stories and his visions will echo for years to come.

- With contributions from P. Fozzard, A.R. Berger, and E.H. Dahlberg, April 1991.

Legal Codes and Small - Scale Mining

A Report and Commentary by J. Davidson

The North American Context

During the past year, in the United States and Canada, proposed changes to time-tested, long standing mining laws have sparked sometimes testy, often heated debate among prospectors, promoters, mining companies and legislators.

Canada

For example, the Prospectors and Developers Association of Canada was virtually accused by a group of individual prospectors and small exploration companies of betraying the trust and interests of the "small" miners in adopting the position of the "majors" in their representations to government vis-a-vis proposed changes to Ontario's Mining Act. Needless to say, the provincial government was also criticized. (See my previous commentary, in the Bulletin, no. 2, for additional details.)

During the past year, discussions regarding regulations to support the proposed amendments to the Mining Act have finished and the new regulations have now been issued. They are due to come into force along with the amendments (Bill 71, also called the Mining Amendment Act, 1989) on June 3, 1991. The final package (amendments and regulations) is a lot less "oppressive" than originally anticipated by some. The assessment work system for mining claims has been converted from a "man-days" basis to an actual dollars spent basis. Under the old system, it was sufficient to do the equivalent of 200 days of assessment work over the initial five years of a mining claim. Completion of this work would establish the right of the prospector to hold onto the mining claim for another six years at minimal cost (no further assessment work, only a modest annual time extension fee), before bringing the property to lease. Now the prospector, in order to maintain title to the claim, will be obliged to perform assessment work throughout the life of a claim, until such time as it is brought to lease. This will increase the cost of holding a claim modestly, and hopefully, from the government's perspective, provide an incentive either to bring a claim to lease or

abandon it on a more timely basis. Once a property is brought to lease, no further assessment work will be required, as originally feared. However, the Minister reserves the right to refuse to renew a lease unless reasonable progress has been demonstrated in bringing the property into production, or the property has been producing continuously for more than a year. This is particularly important, given that the new Act abolishes patenting of mining rights and lands.

United States

The United States Senate is currently debating S.1126, a bill to revise the General Mining Law of 1872. This 1872 law provides the foundation of a system of mining law, statutes and regulations which have evolved over the last 120 years. As in Ontario, certain proposed changes, for example those concerning the implementation of higher royalties and fees, have managed to antagonize small exploration and mining companies, who claim that such changes will threaten the economic viability of the "smaller" operators, negatively impact on their ability to raise venture capital, as well as remove any incentive to prospect for new minerals on unpatented claims. Even without formal revision of the law, some have argued that proposed changes and additions to the regulations which implement the law, will have the same effect - of tightening the screws on small miners. For example, the Bureau of Land Management (BLM), which supervises much of the mining activity on public lands and has been responsible over the years for developing many of the detailed and comprehensive regulations controlling mining operations on these lands, may soon require small mining and exploration operators to post financial guarantees when working on BLM land, where none were required before.

The oft-times negative reactions of small mining interests to "attacks" on established legal frameworks in North America can only be understood in the context of what these "time-tested" laws represent - the acceptance and codification of what the old time miners and prospectors

had "themselves ... developed as a workable body of law," as T. S. Ary, the current Director of the US Bureau of Mines, recently put it (1991). Consequently the law reflected certain basic working principles, namely those of self initiation of mineral rights, access to land for prospecting, exclusive rights to develop a discovery, and security of tenure to hold onto a discovery. In North America, the law evolved out of the early experiences of individual prospector-miners and out of a thriving small-scale exploration and mining industry. Part of the recent discontent in both Canada and the US with the existing laws derives from the notion that because the laws reflect the concerns, interests and designs of a different and by-gone mining era, the laws have become outdated and archaic, and are no longer relevant for today. Almost all opposition to the existing laws, whether justified or not, is seen by the remaining community of small miners as attempts to disenfranchise and ultimately destroy them.

The Developing Country Context

In contradistinction, over the last two years, we have witnessed a dramatic reversal of interest and purpose in a number of developing countries vis-a-vis the role and rights of small miners. In countries in South America, Africa and Asia, governments have finally recognized the critical importance of formalizing the rights and responsibilities of small-scale miners as a distinct group.

Brazil

In Brazil, the government amended its own mining code of 1967 with law no. 7805/89 in July 1989. While "garimpeiros", Brazil's artisanal miners, were allowed to operate and be licensed under the 1967 code, the code was not terribly explicit, permitting municipalities to issue licenses to interested parties, subject only to general approval of the Federal Government. In spite of this provision, garimpeiro activity greatly expanded in an uncontrolled, unlicensed manner, ultimately resulting in encroachment on Indian lands, environmental problems and confrontation with government

authorities. (Refer Bulletin, no. 2, pp. 6-9.) The amendment centralizes authority and control under the Departamento Nacional da Producao Mineral (DNPM) and establishes specific guidelines for garimpeiro activity in terms of size of prospect, duration of permit, assessment work, types of deposits and minerals, mining methods, eligibility for licensing, environmental duties, site inspections and work organization.

Whether this law will result in the "regularization" of small-scale mining activity remains to be seen, given the large numbers involved, their isolated locations, and the lack of any realistic support mechanisms. Meanwhile, at the Bom Futuro tin mine, production once again has come to a standstill (rf. Bulletin, no. 2, p. 3), this time as the independent miners' cooperative and a consortium of Brazil's five largest corporate tin producers argue over who has the legal right to mine tin from the world's largest unregulated tin mine.

Ghana

In May and June 1989, the Ghana government promulgated three laws, the Diamonds (Amendment) Act, the Mercury Law, and the Small-Scale Gold Mining Law. While Ghanaian artisanal involvement in alluvial diamond mining had been permitted since 1972, the original Diamond decree was amended to provide stiffer penalties for failure to sell to the government purchasing agency or its licensed agents. The Mercury Law restricts the import, possession, and resale of mercury to licensed individuals. The Law provides explicit authority to small-scale gold miners to purchase mercury from licensed dealers in reasonable quantities necessary for mining purposes, but the miner is not permitted to resell the mercury and is required to observe "good mining practices" in the use of mercury. Penalties are established for contravention of the law and failure to follow "good mining practices."

The Small-Scale Gold Mining Law establishes the conditions for the registration and licensing of miners. Previous to the passage of this Law, the mining of gold by individual Ghanaians was forbidden. The new Law reserves small-scale mining of gold for the exclusive participation of Ghanaian citizens. Miners may be licensed as individuals, small groups, or co-operative societies. The Law also empowers the Minerals Commission to establish District Small-Scale Gold Mining Centres for

the purpose of registering miners, supervising and monitoring mining activities, providing advice and training to miners, and documenting activity in the District. The rights and obligations of licensed miners are also defined with respect to mining practice, landowners, the use of explosives, the purchase of mercury, income tax and royalty payments, the sale of gold. Penalties are set down for the illegal sale or purchase of gold, for mining without a license, and for contravention of any of the provisions of the Law. This Law provides the backbone of Ghana's Small-Scale Gold Mining Project described in an earlier Bulletin (no. 2, pp. 1-3). While this Project has experienced much initial success in licensing miners, establishing District Centres and legal selling of gold and diamonds, critical problem areas remain to be resolved, including environmental degradation and water pollution problems due to mining, the questionable mercury handling and amalgam retorting practices typically in use even among licensed miners and buyers, the quality and quantity shortage of reasonable reserves for small-scale concession granting, the persistence of illegal activity in certain prime large-scale concession areas. Many of these problems relate to "field" practice and are beyond the scope of

any legal instrument to redress, requiring instead long term institutional commitments and responses.

Philippines

In the Philippines, mineral land reform has been the focus of intense discussion for some time. In 1988, the federal House of Representatives approved Bill no. 10516, an act to create a "people's mining" program. In May 1990, a revised version (Senate Bill No. 1333), entitled the "Small-Scale Mining Act of 1990," was introduced to the Senate and finally approved, though it has yet to be implemented.

Existing legislation had allowed for the alienation of large claim blocks, many of which were held for long periods without prospection or development. Claim staking became a profitable and speculative business, with access to mining concessions also high centralized and restricted. Despite its flaws, the existing system was only recently recognized as being problematic, with the explosion of small-scale gold mining activities during the 1980's. As a result, today 99% of an estimated 400,000 small-scale gold miners continue to operate illegally.

When compared to the Brazilian and



A Legalised Small-Scale Concession Area in Ghana

Ghanaian laws, the proposed "Small-Scale Mining Act" of the Philippines provides the most detailed framework for the legalization and support of small-scale mining. Like the Brazilian law, it is not limited to gold mining, but addresses the small-scale exploitation of a variety of industrial, precious, and strategic minerals. Here too, as in Brazil and Ghana, small-scale mining is restricted to citizens. However, the Philippines' proposal tends to be more explicit and detailed in a variety of areas. For example, small-scale mining is explicitly defined as mining activities which "rely heavily on manual labour without the use of explosives or heavy mining equipment." The Act, when implemented, will establish a Small-Scale Mining Program to be carried out by Provincial/City Mining Regulatory Board(s) under the auspices of the Department of Environment and Natural Resources (DENR). It is not clear from the wording of the Act whether there will be only one or a number of Provincial/City Boards, although it would seem from its given responsibilities that a number of mining province based Boards would make the most sense.

The Board(s) would be responsible for: (a) identifying and setting aside areas deemed technically and commercially suitable for small-scale mining subject to guidelines specified in the legislation vis-a-vis ancestral lands, park lands, watersheds, active mining areas, private lands, unreserved public lands, and areas currently being worked by small miners; (b) distributing mining contracts, with preference given to miners residing in the province where the contract area is located; (c) administering a "Small-Scale Mining Protection Fund" to be used for safety training, mine rescue training and equipment, and for individual assistance to miners injured in accidents; and (d) formulating and implementing all rules and regulations related to small-scale mining. All miners would register with the Board(s), and be encouraged to organize as cooperatives or other legal entities which would qualify them for the award of mining contracts. The composition of the Board and staff support is specified in the Act.

The Act would also allow local governments to establish Mineral Processing Zones, in which the private sector would be encouraged to establish custom mills. Failing that, the federal Government would construct such plants upon

recommendation of the Board(s). The mills would be licensed by the Board(s), and mercury banned in areas where the custom milling facilities are set up. Assay labs would be established by the DENR to monitor the custom mills and service the miners.

The rights and obligations of mining contract holders are detailed in the Act, along with the rights of prior existing claim owners and private land owners. Miners and processors would be subject to all existing environmental, health and safety codes.

The Government's royalty share, as specified in the Act, would be deducted at the time of product sale to a licensed custom mill or to the Central Bank. Government revenues would be divided in fixed proportions between the National Treasury (30%), Province (15%), City or Municipality (15%), Village (10%), Miners Protection Fund (10%), and Reclamation Fund (20%). National and regional coordinating committees would also be created, although their authority is not specified. Provision is made for the revocation of licenses and contracts, penalties for non-compliance, etc.

Of particular interest is the fact that small-scale miners already in operation, as of August 1, 1987, could not be "dispossessed, ejected, or removed from said areas."

Senate Bill 1333 is still under final review by a Congressional conference committee.

Some Thoughts on the Law and Small-Scale Mining

Whether the country is industrialized or developing, a legal framework that either explicitly or implicitly recognizes and addresses the peculiarities of small-scale exploration and mining activity is fundamental to the rationalization, improvement and success of such endeavors. Furthermore, in order to optimize mining development in a country, the legal context of small-scale mining must be defined with regard to how the sector is seen to interact with and/or complement the activities of intermediate and larger scale mining companies.

In North America, for example, updates and revisions of the law should proceed with the concerns of the remnant small-scale mining community in mind, with its historic and current role clearly understood and acknowledged. The demands of

modernization and public relations should not require that we dispose of the baby with the dirty bath water. We should be able to integrate time-tested principles of proven worth with contemporary economic, environmental and resource conservationist concerns, while at the same time providing scope for small-scale mining entrepreneurs to do more than just survive.

In many developing countries where small-scale mining exists, formal recognition of its contribution potential to the domestic economy and community is yet to be realized. In Brazil, Ghana and the Philippines where its impact can no longer be ignored, positive steps have been and are now being taken to "regularize" the sector. The regularization effort typically starts with the drafting of a legal code. But a law, no matter how detailed or comprehensive its statutes and regulations, is not sufficient in and of itself to bring about the desired regularization and rationalization. The law is an essential starting point, that requires not only a political will to set it firmly in place and to resolve new problems as they may emerge, but also the wherewithal to provide the support structures, personnel and financial resources to ensure its successful implementation. None of this is easy or straightforward in places where people are preoccupied with simply keeping their heads above water, where there is always too much to do but not enough time, money, or willpower to do it all.

The simple fact of the matter is that the real difficulties only begin after the laws are drafted and approved, for then the ways and means must be found to make them work.

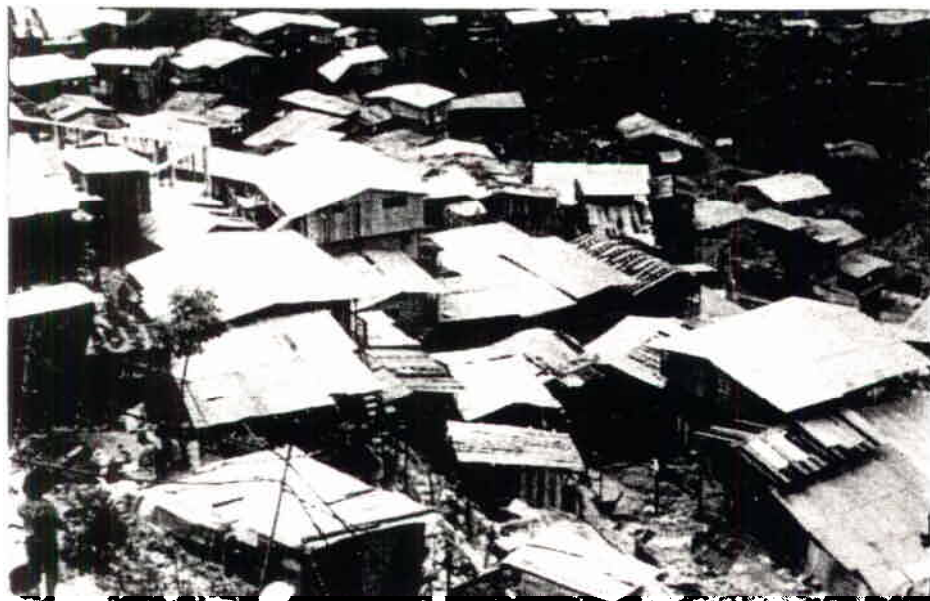
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The various mining laws and acts, as noted.

Gold Mining in Zamora Province

by Joaquin Garcia Doltz



Hill top mining town of Nambija. Mine workings are located under the town.

(Photo courtesy of Ecuador Order of Geologists)

Ecuador has been favoured by nature because in its soil and subsoil, huge reserves of metallic and non-metallic ores have been found. From pre-colonial times, people have been working mines for gold, silver, platinum, etc. This effort was intensified during the colonial period due to the Spanish hunger for precious metals. But after independence and the beginning of the republic, all mines and deposits were closed to further exploitation, and remained so until the 1980s.

Some sporadic gold mining activity has taken place since the beginning of the century. After 1978, farmers colonising Eastern Ecuador rediscovered some secondary pre-colombian deposits in the river terraces of the East region, in the mountains and on the coast. In exploring and exploiting them, they also found the primary deposits originally worked by the indigenes and Spanish. At this time the "petroleros" (artisanal miners of Ecuador) also rediscovered the primary gold deposit of Nambija. This deposit is located in Southern Ecuador, in Zamora Province, and has a remarkable gold production (250 000 ounces/year, 750 ounces per day). Ore grades range from 15 gpt to 400 gpt. Nambija produces 70% of the country's gold and this production

has made Ecuador the world's 13th largest gold producers (395 000 ounces of gold produced in 1989).

While there has been a mass arrival of "petroleros" to Nambija, this new gold "fever" has spread to other locations such as: Campanillas (40 to 60 gpt), San Carlos (8 to 25 gpt), Cambana (8 to 30 gpt), Guaysimi (30 to 50 gpt), Chinapintza and Lapangui (20 to 50 gpt). Approximately 200 000 people are involved in exploiting, treating and enhancing the mineral and then marketing it. They work as unskilled labour, chargers, mulers, gold buyers, etc. These people undertake extraction and exploitation in a non-technical, non-systematic manner guided only by the know-how of some miners who have worked in the polymetallic deposit of Portovelo (Del Oro Province).

For mining, air compressors, hammers, dynamite, boring equipment are used. The principal milling tool is the "chancadora" which is a hammer mill activated by hydraulic or power unit energy. The basic gold recovery system involves the use of mercury for amalgamation in either a manual or mechanical way with the help of the "chanchitos" (amalgamation retort/roasters). After amalgamation, the mercury is burned-off with predictable consequences for

the environment. Gold recovery with this procedure is 55%. The rest of the gold is sent to the mine dumps hopefully to be re-treated at a later date when a better recovery system becomes available.

In many cases, the "petroleros" have organized themselves into legally constituted associations, societies and mining cooperatives in order to operate within the framework of the mining laws of the country and to be able to attract national and foreign capital interested in investing in Ecuador's mining sector. An example is the "Compania Rio Tinto Zinc Inc." which has reached an agreement with the mining cooperative "San Luis" to help evaluate and exploit their mining concession. In the area of Campanillas, the company MIZANA backed by British capital is working with the mining cooperative "Orquidea de los Andes". The Nambija sector is now receiving special treatment from the government in an effort to legalize the "petroleros" and provide them with legitimate mining concessions, thereby allowing both public and private involvement to ensure better recovery of the gold resource and the other minerals associated with it.

A number of public and private projects to construct some regional treatment plants were recently implemented with the goal of improving metal recovery and treating the waste depots created during the last decade. These waste depots grading from 10 to 30 gpt have not been treated due to the lack of appropriate technologies available to miners.

From a geological point of view the deposit of Nambija and its environment are in a skarn zone produced by the intrusion of a granitic-granodioritic batholite in contact with carbonated rocks of the "Santiago" and "Napa" formations. This produced unusual concentrations of gold, silver, and lead-zinc sulphides controlled by big fractures and faults oriented northeast-southwest.

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Gold Mining in the Tilaran Cordillera

by Steve Williamson

Introduction

The mineral sector plays a minor role in Costa Rica's economy, being overshadowed by agriculture and tourism. However, there is considerable potential in Costa Rica for mineral sector development, all that is lacking is investment.

While there are a large variety of metallic and non-metallic mineral deposits in Costa Rica, this report focusses on gold mining activity, as it is dominated by small-scale mining operations. First the location and scope of current gold mining activity is described. Second, two operations, an underground mine and an open-pit operation, are reviewed. Finally, the factors that promote and hinder the development of the small-scale mining sector are discussed.

Scope of Current Gold Mining Activity

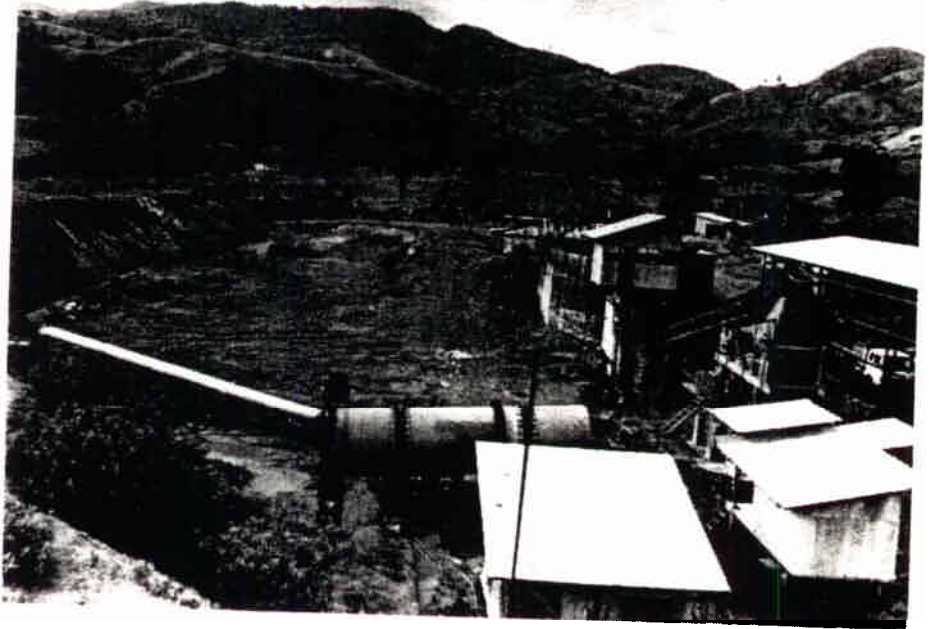
There are two main gold mining districts in Costa Rica, one in the Osa Peninsula, on the country's south-west coast, and the other in the Tilaran Cordillera in the north-west. The deposits in the Osa Peninsula are all reported to be placers, and are worked by individuals or syndicates using artisanal techniques. In the Tilaran region, the deposits are generally stockwork vein or narrow-vein epithermal deposits (Table 1). The mines in this region vary from small pits dug by miners (individuals or syndicates) using picks and shovels to extract near surface ore and reportedly, mercury amalgamation to recover the gold (e.g. Boston at Gongolana) to underground mines employing rockdrills and dynamite to break the ore and relatively sophisticated mill circuits to produce a concentrate (Mina Tres Hermanos at Las Juntas).

Mine Descriptions

This section briefly describes the operations at Mina Tres Hermanos and Rio Chiquito in the Tilaran Cordillera.

Mina Tres Hermanos (The Three Brothers Mine)

Mina Tres Hermanos is Costa Rica's major gold producer. Discovered last century, this mine has a long history of exploitation. The current operation commenced production three



Rio Chiquito Crushing Plant

years ago and has a mill capacity of 200 tpd (about 72 000 tpy). However, at the present time, production averages 120 tpd. This puts the mine at the upper limit of what is sometimes defined as a small mine in a developing country. A total of 50 miners are employed in the mine. Two 12-hour shifts are worked per day, 6 days per week.

The deposit consists of a 1-4 meters wide quartz vein, dipping 70-75° W and striking NE-SW. Shrinkage stoping is used as the mining method. Hand-held air-leg rock drills are operated by a crew of 2 to drill out faces, and dynamite is used to blast the rock.

The ore is fed through wooden chutes and ore passes down to a haulage level where it is then transported out of the mine to the crusher in 1 tonne ore buckets usually pushed by hand. The crushed ore is transported by road several kilometers to the treatment plant. The average grade of the ore is 0.20-0.21 oz/t (about 6 gpt). A clay rich footwall causes up to 10% dilution in mining. Mine recovery is approximately 90-95% and mill recovery is between 86-90%.

The current operation had a 1.2 year pre-production period during which time the mill capacity was expanded from 80 to 200 tpd at a cost of 1.2 million US \$ and mine development was

carried out at a cost of 0.6-0.8 million US \$. Ore reserves are reported to stand at 500 000 tonnes at about 6 gpt, giving the mine another 10-year life at current rates of production.

Rio Chiquito Mine

Rio Chiquito was discovered in 1983. However, poor access and heavy rains hampered exploration. In October 1986 development of an open pit and construction of a heap leach operation began. In October 1987 the mine began producing. Between October 1987 and June 1989, approximately 96 000 tonnes of ore and 400 000 tonnes of waste were mined. Since June 1989, the mine has been shut-down while exploration continues.

The ore body consists of sinters, breccias and quartz veins and stockworks hosted by andesite. The mineralization includes marmatite, pyrite, barite and cinnabar. The ore zone is strongly argillized, while adjacent wall rock has undergone propylitic alteration. There are two ore types: an oxide, clay rich ore and a sulphide ore. Gold, silver, and mercury are recovered from the ore. The Ag:Au ratio is approximately 10:1. The ore body is centred on a NW striking fault, which dips steeply to the NE. All mineralization is above the fault and

up to 15 meters wide by 80 meters long.

In the pit 1.5 meters bench heights are used. No or very little blasting is required. The ore is loaded on 2-tonne trucks and transported 1/2 kilometer to the crusher. Once crushed, the ore is agglomerated with cements and fed onto the leach pad via a radial stacker. Cyanide is sprinkled over the leach pads and the pregnant solution gravitates to pregnant solution ponds. The Merrill-Crowe process is used to concentrate the ore. Mercury is removed from the precipitate by retorting and the final precipitate is sent to the United States for smelting.

Eighty people work in the mine on 2 shifts. When in operation the plant was processing on average 300 tpd of ore. Mines recovery was estimated to be 80% and mill recovery 70% (0.55 ppm Au in tailing).

The capital cost for the operation was reported to be in the vicinity of 5 million US \$, with a 1 year pre-production period. No reliable figures were available for operating costs. The current ore reserves are

250 000 tonnes at approximately 1.6 ppm Au.

Factors Affecting the Development of Small-Scale Mining in Costa Rica

The Costa Rica government pays a 20% premium to companies for all their export earnings. Furthermore, export earnings are tax exempt and machinery imported to produce export items is exempted from import duties. However, a complicated bureaucracy can cause long delays in receiving equipment when import tax exemptions are sought. In general, these tax benefits are only realizable by the larger scale mining operations while the small-scale, especially artisanal, miners are unable to take much advantage of them.

Of benefit to the mining sector in general is the high standard of Earth Sciences education. The University of Costa Rica has the only mining school in Central America.

The main factor hindering mineral resource development in Costa Rica is the number of National Parks. Costa Rica is one of the most de-forested countries in Central America, yet it has promoted for itself an image

of being a leader in environmental conservation. Outwardly, government authorities appear to be sensitive to the problem of artisanal miners using mercury and to the potential loss to the country's aesthetic value caused by mining operations. As mining contributes little to the economy in comparison to tourism, it can be presumed that mining will take a back seat when there is potential recreational uses for the land. One area where this is not the case is in the Osa Peninsula where the local miners apparently defend their right to mine with much vigor.

In general wage levels are low in the mining sector, second only to agricultural labour. Consequently, comparatively few people are drawn into mining. Furthermore, most domestic investors are probably deterred by the financial risks involved in mining and exploration, preferring to invest in other sectors of the economy. Only in the Osa Peninsula does it appear that the potential rewards from small-scale artisanal operations are sufficient to draw a significant number of miners to the region.

* Reporting from Costa Rica for SMI.

Reference: Republica de Costa Rica, Organizacion de Los Estados Americanos, Diagnostico des Sector Minero, San Jose, Diciembre 1978.

Addresses: Dirreccion de Geologia Minas e Hidrocarbonos
Ministerio de Recursos Naturales, Energia y Minas
Director: Lic. Jose Francisco Castro
Assistant Director: Lic. Rolando Valdez

Table 1. Gold Mining Activity in the North-West (Tilaran Cordillera)

Name of Operation	Location	Comments
1.Mina Tres Hermanos	Las Juntas de Abangares	Active underground mine, 120-200 tpd, shrinkage stoping, crushing on site, treatment plant off-site
2.El Reas	Las Juntas	Exploration
3.Boston	Gongolona	Exploration, plus 30-100 artisanal miners, non-systematic exploitation
4.Bellavista	Miramar de Punta Arenas	Exploration, about 11 t removed at 1 gpt
5.Rio Chiquito	Rio Chiquito, Tilaran	Exploration for extensions to the current reserves, 300+ tpd open pit operation on stand-by

N.B. This is not an exhaustive list of exploration activity.

Building a Database on Small-Scale Mining of Industrial Minerals

Introduction

Regulation, improvement and supervision of mining activities in Indonesia fall within the spheres of responsibility of both local and central governments. All data and information relating to mining operations including information on mine planning and design, mine improvement, decision making, supervision, etc. are basically derived from two sources - either routine administrative reports and records of the mining company or government statistical reports based on field investigations.

While coal and metallic mineral mining activities generally operate on a large scale and have proved to have reasonable administrative and reporting systems in place, industrial minerals operations mostly occur as small-scale ventures, with little or no formal reporting procedures. Until the mid 1970's, the government had virtually no organized information concerning the nature, scope and scale of industrial minerals mining and processing activities, and had made little effort to collect such information. This lack of attention to the industrial minerals sector was related to a number of factors including - the near surface and uncomplicated nature of the deposits which lent themselves to mining and processing using simple affordable technology and to being worked informally, the limited capability of local governments to monitor and supervise their development, communication difficulties which existed between mining companies and government agencies, as well as a lack of cooperation between government agencies. Apart from the above, many industrial mineral producers operated and continue to operate illegally.

The unavailability of routine administrative reports from this sector of mining activity meant that the development of any sort of formal descriptive database would involve the use of direct assessment techniques for data collection, i.e. field investigations and surveys. To this end, a proposal for collecting data on industrial minerals extraction and processing in the

field was implemented in 1977 with West Java province serving as the pilot study area. Data collection was eventually extended to all provinces, excluding only the city of Jakarta.

A complete survey was made of all legal operations, while illegal mines were "sampled". As a result of this effort, the evaluators identified over 80,000 small-scale mining and processing enterprises. They estimated that over 365,000 Indonesians were directly employed in this sector, and that close to Rupiah 107 billion (at 1983 constant prices) of gross value had been added to the national economy by this sector.

Scope of Study

Data collection was limited to industrial mineral operations, including such commodities as stone, clays, sand and gravel, phosphates, rock salts, marble, limestone, dolomite, calcite, kaolin, bentonite,

sulfur, gemstones, and diamonds. It involved both licensed and unlicensed mining companies in production during the survey periods.

Data Collection Procedure

Due to the limited manpower available to the Ministry of Mines and Energy for such a labour intensive task, the survey was carried out under the auspices of the Mineral Technology Development Centre based in Bandung but with the assistance of the Central Bureau of Statistics. A special task force was assembled and members were sent to various regions to be attached to local government organizations. First a directory of all mining companies operating in the area was compiled. This was followed by detailed data collection. A detailed survey and record of operations was collected from licensed mining companies, employing over 20 people, while unlicensed operations were sample surveyed.

TABLE 1

NO.	PROVINCE	LATEST DATA	TOTAL COMPANY		NO. OF MINERAL COMMODITIES	TOTAL PERSONS ENGAGED	
			LICENSED	NON LICENSED		LICENSED	NON LICENSED
1	D.I. Aceh	1982	73	954	6	1,002	4,648
2	North Sumatra	1982	216	2,744	6	1,625	11,041
3	West Sumatra	1982	57	1,910	9	587	6,729
4	Jambi	1982	9	934	5	51	2,831
5	Riau	1981-1982	74	837	6	605	3,497
6	Bengkulu	1981	15	594	5	205	2,348
7	Lampung	1984	20	3,867	5	804	14,617
8	South Sumatra	1980	83	562	8	1,337	2,551
9	West Java	1983	939	8,469	18	12,746	51,757
10	Central Java	1984	526	18,096	11	6,007	63,333
11	East Java	1984	123	15,631	15	3,586	82,708
12	D.I. Yogyakarta	1980	29	7,645	9	----	20,332 m >
13	Bali	1984	5	4,919	6	16	22,442
14	South Kalimantan	1980	26	329	7	200	1,964
15	Central Kalimantan	1980	7	133	5	148	738
16	West Kalimantan	1981	52	86	5	881	1,307
17	East Kalimantan	1983	64	227	7	963	1,731
18	North Sulawesi	1983	12	1,833	5	69	1,627
19	Central Sulawesi	1983	60	681	6	657	2,522
20	South Sulawesi	1984	214	2,482	9	1,485	13,765
21	Southeast Sulawesi	1983	38	634	5	293	3,203
22	West Nusa Tenggara	1982	14	2,481	5	67	10,057
23	East Nusa Tenggara	1982	3	843	7	79	3,207
24	Maluku	1984	----	462	4	----	1,222
25	Irian Jaya	1984	11	594	7	156	1,917
			2,670	77,947		33,549	331,794

m > Including licensed companies

For all classes of operation, certain basic data was collected, including name of company and legal status, addresses and mine location(s), responsible parties; lease specifics (if licensed) e.g. license number, total lease area, lease duration, issuing office; and basic operating data concerning mineral deposit(s), estimated reserves, mining and processing methods, sources of funds, total manpower, productivity, production capacities, equipment configurations, operating cost breakdown, marketing arrangements, and the estimated value of the commodities produced per unit of production.

Results

Data collection activities started in West Java province in 1977 and were extended to cover most of the rest of the country during the years which followed. As of 1984-1985, 51 separate data gathering exercises had been completed, providing up-to-date information on all provinces, except for East Timor. East Timor was surveyed for the first time in 1990. Jakarta was also excluded from the survey, insofar as Jakarta's industrial minerals consumption is supplied principally from sources outside Jakarta city province boundaries, especially from West Java.

From the identified 80,617 small-scale industrial mineral enterprises operating in Indonesia, only 2,670 were found to be licensed (rf. Table 1). There were approximately 30 illegal operations for every legal one. However, the ratio varied dramatically between provinces, from 4 to 1 in West Kalimantan to 981 to 1 for Bali. In Maluku province, there were no licensed operations.

During the study period, it was found that the province with the most highly evolved and diversified sector was West Java where 18 different types of industrial minerals were being exploited. In general, the level and diversity of activity was higher on Java (9-18 commodities) than elsewhere (4-9 commodities).

The total recorded manpower employed in industrial mineral mining activity was 365,343 people, of which 33,549 were employed by licensed companies with the remaining majority involved in unlicensed operations. Of the total available manpower, i.e. the economically active population of 61.4 million people, the industrial minerals sector absorbed on average

NO.	PROVINCE	LATEST DATA	PRODUCT PRICE (Million Rp.)		GROSS VALUE ADDED AT CONSTANT PRICE (Million Rp.)	GROSS DOMESTIC REGIONAL PRODUCT AT CONSTANT PRICE (Million Rp.)
			LICENSED	NON LICENSED		
1	D.I. Aceh	1982	4,043.743	2,737.531	6,265.268	2,969,529.652
2	North Sumatra	1982	810.684	3,443.003	4,137.731	3,177,607.362
3	West Sumatra	1982	3,905.615	2,393.961	5,944.842	1,080,368.098
4	Jambi	1982	197.302	791.600	870.381	384,867.076
5	Riau	1981-1982	1,116.923	1,839.175	2,187.979	5,783,128.834
6	Bengkulu	1981	166.279	409.909	592.358	164,174.287
7	Lampung	1984	1,673.792	2,240.634	3,389.750	1,137,979.817
8	South Sumatra	1980	1,830.972	665.580	1,973.698	2,403,186.813
9	West Java	1983	14,754.063	17,904.741	27,904.581	10,190,700.000
10	Central Java	1984	1,617.462	12,069.305	12,153.563	7,649,816.090
11	East Java	1984	4,354.601	17,168.594	19,632.446	11,972,554.937
12	D.I. Yogyakarta	1980	-----	2,009.106	2,100.699	450,219.780
13	Bali	1984	9.065	6,744.442	6,129.115	1,029,614.260
14	South Kalimantan	1980	59.223	270.248	357.582	477,032.967
15	Central Kalimantan	1980	110.902	312.065	442.129	384,615.385
16	West Kalimantan	1981	478.856	310.334	746.737	4,052,501.345
17	East Kalimantan	1983	1,168.639	1,267.518	2,027.802	4,163,500.000
18	North Sulawesi	1983	114.530	1,692.397	1,729.098	671,600.000
19	Central Sulawesi	1983	1,195.171	353.364	1,391.546	364,100.000
20	South Sulawesi	1984	1,160.850	3,327.201	3,809.217	1,888,239.178
21	Southeast Sulawesi	1983	163.835	383.858	591.453	294,300.000
22	West Nusa Tenggara	1982	29.838	1,350.945	1,340.561	456,748.466
23	East Nusa Tenggara	1982	17,403	193.393	202.502	417,995.910
24	Maluku	1984	-----	350.951	267.335	547,863.812
25	Irian Java	1984	113.566	893.662	799.179	855,512.591
			39,093.314	81,123.517	106,987.752	62,967,756.660

0.6%, ranging from 0.1% in Central Kalimantan to 4.35% in Bali.

In terms of production value (rf. Table 2), however, the ratio of unlicensed to licensed was only 2 to 1, Rupiah 81 million vs. 39 million, suggesting that the licensed operations either operated more efficiently or were larger scale or both. Converted to 1983 constant price values, the gross value added by this sector was Rupiah 107 billion, which was about 0.21% of the provinces' gross regional domestic product. The largest producers of value were the three Java provinces, led by West Java.

Discussion

Indonesians have long been engaged in mining a wide range of minerals. The extraction of kaolin, sand and gravel, lime, marble, phosphate, bentonite, manganese, gold and diamonds, however, has historically occurred on a limited scale. The government has recognized that the mining of these commodities is commonly carried out in ways that are often detrimental to the national interest. For example, illegal small-scale activity seems to act as

a restraint on the operations of licensed mines; it has often had serious negative environmental impacts. As well, it has and can continue to be an obstacle to optimizing resource utilization, and as an illicit venture fail to contribute its fair share to government revenues. In Indonesia, illegal mining has also had questionable social impacts. As a highly individualistic activity, it makes little or no contribution to the general community welfare, and has often served as a vehicle for increasing exploitation and disparities between a monied class and those of less fortunate means.

Efforts to rationalize and improve such operations are often handicapped by the fact that the mines are commonly operated by individuals without reference to any appropriate or systematic managerial system or approach. In spite of all these problems, such activities have clearly generated a high level of employment, which is seen as a positive impact. The government is now promoting a concept of small-scale mining appropriate to the Indonesian context, called "Pertambangan Skala Kecil." It is

based on the idea that people are part of the national resource base for developing the country. This notion is in keeping with the national development philosophy that people are not only the object, but also the subject of development.

Objectives of PSK

The goals that underlay the development of a distinctively Indonesian approach to the development of small-scale mining include (Gandataruna, 1990):

- 1) Enhancing the participation of social groups in mining activities within the existing national framework;
- 2) Encouraging community economic development through mining activity based on social group consensus, needs, and capabilities;
- 3) Bridging existing gaps between social group capabilities and those of established large mining companies;
- 4) Enabling the government and established mining enterprises to improve social group participation in the mining sector;
- 5) Allowing for the wise use of the nation's mineral endowment, i.e. conservation, as well as better environmental protection and control;

6) Bringing into harmony the differing interests of the various groups involved in mining in order to facilitate the achievement of broader national development objectives and goals;

7) Protecting communities and social groups from irresponsible capitalists who wish to exploit them;

8) Educating and strengthening the abilities of social groups to face the future advance of technology.

References

Gandataruna, K., 1990, "The role of the social group in mining development in Indonesia (Peran serta rakyat dalam pengangkutan pertambangan di Indonesia)," Pertambangan dan Energi, no. 1, pp. 73 - 76.

Ed. Note: This is an abridged and edited version of a paper entitled "Small-Scale Mining Data Collection Activities in Indonesia," presented by Dr. Ukar Soelistijo to the SMI Workshop on International Information Systems for Small-Scale Mining, held in Ottawa on June 29, 1990.

For further information, please contact Dr. Ukar Soelistijo, Director, Mineral Technology Development Centre, Jalan Sudirman 623, Bandung, INDONESIA.

Conclusion

The social and economic benefits of FADEMIM's assistance programs could be far reaching. Small mining has been the pioneer of mining development in Bolivia. All of the large mines were first small mines (Arce, 1978). As some 5 000 or more prospects and mines may be evaluated under the auspices of FADEMIM, it could become one of the best exploration tools the country will have. Furthermore, as small mines are helped to upgrade to larger scale operations, this will provide more export earnings, clients for private banks and hopefully an improved standard of living for inhabitants of Bolivia's mineral rich Altiplano.

References

Arce, R., 1978, "Small-Scale Mining in Bolivia," in Meyer and Carman (eds), The Future of Small-Scale Mining, UNITAR, pp. 219 - 227.

* This report was written by Steve Williamson in Bolivia for SMI.

Acknowledgement: The author wishes to thank Mr. Roberto Arce, Mr. Oscar Davila, the National Chamber of Small Mines and the Ministry of Mining and Metallurgy for their generous assistance in providing information for this report.

SMI News

- The International NGO Division of the Canadian International Development Agency renewed its operating grant to SMI for 1991.
- The project proposal "International Small Scale Mining Information System" submitted to International Development Research Centre (IDRC) in February 1990 was approved by the IDRC's Board of Governors and now awaits Government of India approval.
- SMI held a one day workshop on International Information Systems for Small Scale Mining in Ottawa, Canada, on June 29, 1990. Over 35 people attended from 23 different countries. Papers were presented by G.O. Kesse (Ghana), B.N. Niyogi (India), U. Soelistijo (Indonesia), J. Hruska (Czechoslovakia), E.H. Dahlberg (USA). J. Davidson, SMI's Managing Director presented an outline of SMI's proposed information system project for comments and discussion. Dr. Soelistijo's paper appears in abridged form in this issue of the Bulletin.
- Three SMI Board of Directors vacancies were filled during the past year with the appointments of Sr. Carlos Oiti Berbert (Brazil), Ir. Rachman Wiriosudarmo (Indonesia), Prof. Deborah E. Ajakaiye (Nigeria).

BOOK REVIEW

"Small-scale mining - guide to appropriate equipment"

Prepared by James F. McDivitt, Dennis Lock and others on behalf of the Association of Geoscientists for International Development Intermediate Technology Publications Ltd., 103-105. Southampton Row, London WC1B 4HH, 100 pp, illus., 1990. ISBN 1 85339 012 7 Available for \$25.00 US (plus shipping and handling costs) from Small Mining International, P.O. Box 6079, Station "A", Montreal, Quebec, CANADA, H3C 3A7 or 12.50 £ from Intermediate Technology Publications Ltd., in London.

This publication, commissioned by the Association of Geoscientists for International Development (AGID-headquarters in Bangkok) and published by Intermediate Technology Publications (London) in association with the International Development Research Centre of Canada, with assistance from the Commonwealth Science Council, is a commendable first attempt to bring together information on a wide range of basic prospecting and mining equipment, suitable for small-scale mining (defined as producing up to 100 000 tonnes per year). Mining on a small scale does not necessarily exclude the use of sophisticated equipment: the Guide covers categories ranging from appropriate or intermediate technology equipment, often of local fabrication, through standard equipment and equipment specially manufactured for small mines, to equipment of high capital cost. The criteria governing the choice of equipment are discussed in an introduction, followed by a general review of small-scale mining's characteristics, and its advantages and disadvantages.

In only 100 pages, compilers James McDivitt and Dennis Lock and their collaborators give details of over 150 items ("items" in the generic sense: mini-excavators; trommels, etc.), classified in seven sections

covering exploration, surveying, sampling, analysis and testing, drilling, alluvial mining, underground mining, sorting, crushing, grinding, processing, materials handling and transportation, pumping, ventilation, power supply, general purpose equipment and safety. A general introduction precedes each section. For certain items, the names and addresses of several suppliers are given: 147 companies are listed alphabetically in an Index of Suppliers. Numbers beside each supplier's name refer the reader back to the page on which the item is illustrated.

The items catalogued, ranging from gold pans to mine winders, are clearly illustrated, either by photographs or line drawings. The layout is clear and uncluttered, only one or two items to a (large) page, each item boxed in a bold outline. Descriptions of the items are short but succinct, normally including the purpose for which they are used, the manner in which they are used, and how the item operates to achieve its purpose - just to read these descriptions is to learn much. The compilers have, to their credit, included many items capable of being fabricated locally (sluicboxes, etc.), but inevitably, most of the equipment described is of commercial

manufacture. Perhaps inevitably also, the majority of these manufacturers are European or North American, although China, India and Argentina are, happily represented. If this reviewer has a criticism of the list of suppliers, it is not so much in which suppliers are included, as in which are left out, Richards (U.K.) or I.H.C. (Netherlands) for small-scale mobile alluvial mining units, for example. However, faced with the monumental task of selecting only a few names from the hundreds of suppliers available, the compilers cannot be blamed for what is, unavoidably, a somewhat subjective task. It is after all, a "guide" rather than a catalogue, and hopefully, readers will use it as such, to obtain an overview of the sort of equipment available for their own particular requirements, and where they might start to look for it. It is to be hoped that the appearance of this guide will prompt interested persons, both manufacturers and users, to provide the Intermediate Technology Development Group (ITDG) with constructive feedback, with a view to producing bigger and better subsequent editions.

-A.N. Dempster, Dublin, February, 1991

PUBLICATIONS

Geology of Construction Materials by John E. Prentice, 202 pp, 1990. ISBN 041229740X. Available from Chapman and Hall Ltd., Cheriton House, North Way, Andover, Hampshire, England SP 10 5 BE for £ 16.50.

Gemstones by Michael O'Donoghue, 372 pp, 1988. ISBN 041227390X. Available from Chapman and Hall Ltd., Cheriton House, North Way, Andover, Hampshire, England SP 10 5 BE for £ 39.00.

CALENDAR OF EVENTS

June 3-5, 1991. A symposium on the geology of alluvial gold placers will be held in La Paz, Bolivia. For information contact G. Herail (35 77 23 - 32 22 77) or A. Arteaga (35 20 36) or write ORSTOM, P.O. Box 9214 La Paz, BOLIVIA, Fax: 39 14 64, Telex: 3514 ORSTOM BV.

June 10-12, 1991. The Second International Conference on African Mining: African Mining '91 will be held in Harare, Zimbabwe organized by the Institution of Mining and Metallurgy. For information contact The Conference Office, The Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, ENGLAND, Tel: 01-580 3802, Telex: 261410 IMM G, Fax: 01-436 5388.

October 3-5, 1991. An International Conference on Small-Scale Mining will be held in Calcutta, India hosted by the Mining, Geological and Metallurgical Institute of India in collaboration with SMI, the Intermediate Technology Development Group, and the National Institute of Small Mines. For information contact the Organising Secretary, ICSSM, c/o MGMI, 29, Chowringhee Road, Calcutta-700016, INDIA. Telefax : 91-33-286604. N.B.: Rescheduled due to Gulf crisis.

October 8-11, 1991. III Congreso Internacional Geologico de Minería will be held in Guayaquil, Ecuador organized by the Colegio de Geólogos del Ecuador. For more information contact Geol. Hugo Lozano Aguirre, Coordinator General, Facultad de Ciencias Naturales (Universidad de Guayaquil) Av. 25 de Julio y Pio Jaramillo, Casilla 471, Guayaquil, ECUADOR, Tel: 435366.

October 28-30, 1991. A seminar on mechanized drilling and loading in narrow vein mines will be held in Salt Lake City, Utah, USA, organized by World Mining Equipment. For more information contact Jeannie Lee (Conference Officer), World Mining Equipment, 220 Fifth Avenue, New York, New York 10001, USA, Tel: (212) 213 6202, Fax: (212) 213 1870.

November 11-13, 1991. An international conference on alluvial mining will be held in London, England organized by the Institution of Mining and Metallurgy. For more information contact the Conference Office, The Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, ENGLAND, Tel: 01-580 3802, Telex: 261410 IMM G, Fax: 01-436 5388.

November 20-21, 1991. Minemetal '91, the Second International Symposium on Mining and Metallurgy will be held in Havana, Cuba, organized by Cuba's Research Centre for the Mining and Metallurgical Industry in association with the Laterite Research Centre. For more information contact the Organizing Committee, Minemetal '91, Palacio de las Convenciones, Apartado 16046, La Habana, CUBA, Tel: 22 5511 al 19, Telex: 511609, Fax: 22 8382.

February 4-6, 1992. A conference and exhibition on Minerals, Metals and the Environment will be held in Manchester, England organized by the Institution of Mining and Metallurgy. For more information contact the Conference Office, The Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, ENGLAND, Tel: 01-580 3802, Telex: 261410 IMM G, Fax: 01-436 5388.

March 18-21, 1992. The Third Asia/Pacific Mining Conference will be held in Manila, Philippines sponsored by the ASEAN Federation of Mining Associations and hosted by the Chamber of Mines of the Philippines. For more information contact The Conference Manager, 3rd Asia/Pacific Mining Conference, Cahners Exposition Group (S) Pte Ltd., 1 Maritime Square, #12-01, World Trade Centre, Singapore 0409, Tel: 271 1013, Telex: RS 39200, Fax: 274 4666.

May 17-19, 1992. The 10th Industrial Minerals International Congress will be held in San Francisco, USA. For more information contact Joyce Griffiths (Editor), Industrial Minerals, 16 Lower Marsh, London SE1 7RJ, ENGLAND, Telex: 917706, Fax: (071) 928 6539.

CURRENT OPPORTUNITIES

Investment and Technical Assistance Opportunities

Egypt. Promoter seeks financial and technical assistance on a joint-venture basis in order to exploit an abandoned quarry of red-pink porphyry known as imperial stones, formerly used in ancient Egypt and Rome for monumental works. Area covers some 50 x 200 metres with estimated depth of 1 200 metres. Rocks are composed

of andesine and hornblende phenocrysts in a ground of glossy mass minerals, coloured through iron oxides and piedontite. Moustafa Hamdy A.H., Managing Director, Engineering Management & Projects Co., P.O. Box 496, Maadi. Telex: 94039 SALIN-UN.

Ghana. Mining company with licensed concession seeks cooperation and financial assistance, on joint venture basis, to exploit a gold and diamond deposit. Detailed documentation and maps available on request. Symon Kwame Avasim, Managing Director, Basogad Company Ltd., P.O. Box 8054, Accra-North.

Iran (Islamic Republic of). Entrepreneur with a mining concession for open-pit perlite and diatomite deposits seeks financial and technical assistance on a joint-venture basis, with buy-back agreement, to manufacture filter aids and other industrial products from perlite and diatomite minerals. Chemical analysis of the minerals, land, infrastructure, and low-cost energy available. K. Amini, Silk Road Trading Ltd., No. 8, 2nd floor, Majid Bldg., Iman Khomeini Avenue, Bandar Abbas. Telex: 362790 SACO IR.

Nigeria. Entrepreneurs seek financial assistance on a joint-venture basis to cut and polish granite blocks and manufacture floor tiles for export and local markets. Infrastructure, large quarry, labour and technical study of the deposit available. B.A. Momodu, Manager, Jidaire Scientific Co. (Nig.) Ltd., P.O. Box 3333, Benin City.

Nigeria. Mining company seeks joint-venture partners, with technical know-how, to assist in the quarrying of such mineral deposits as: dolomite, limestone, kaolin, gypsum, bentonite and baryte, and their processing into industrial chemicals. J.E. Agenmonmen, Vice-President, Freedom Development Co. Ltd., P.O. Box 2589, Benin City. Telex: 41351 FREECO NG.

Sri Lanka. Mica-mining company seeks know-how and technical advice to process scrap mica into mica sheets. Suren Abey Suriya, Impels Granite Exports (Pvt) Ltd., 85 1/1 Ward Place, Colombo 7. Telex: 22082 X-POINT. Telefax: 94-1-699754

Zambia. Co-operative union seeks joint-venture partners, plant and equipment, technical know-how, training and financial assistance to mine dolomitic limestone and manufacture agricultural lime for fertilizers. Composition varies from almost pure calcium carbonate to impure dolomitic marble containing silicate minerals. Joel Chitafu, Chairman, Ndola Rural District Co-operative Union Limited, P.O. Box 86, Masaiti.

Extracted from recent issues of the UNIDO newsletter.



Water control and preconcentrating system of an alluvial gold sluicing operation in Ghana

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SMI is a non-profit organization dedicated to strengthening and supporting the small mining sector as an aide to rural development, social and economic, especially, but not exclusively, in developing countries.

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Contributions in English, French, and Spanish on all aspects relating to small-scale mining, including upcoming events and new publications, as well as, comments and suggestions are welcome.

Requests for information on membership and subscription requirements can be addressed to SMI's Managing Director at the above address.
