DANMARKS OG GRØNLANDS GEOLOGISKE UNDERSØGELSE RAPPORT 2009/22

Identification of opportunities of promoting the mineral resources of Bolivia

Peter W. U. Appel & Per Kalvig

GEOLOGICAL SURVEY OF DENMARK AND GREENLAND
MINISTRY OF CLIMATE AND ENERGY

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Danish Ministry of Foreign Affairs
DANIDA

Environment Sector Programme Support

Component 3

Bolivia

Mission Report

IDENTIFICATION OF OPPORTUNITIES OF PROMOTING THE MINERAL RESOURCES OF BOLIVIA

Undertaken by Peter W. U. Appel and Per Kalvig, GEUS, Denmark

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Preface

This report is the result of a consultancy project to Bolivia financed by the Danish Ministry of Foreign Affairs/ DANIDA, carried out by GEUS during the period 16 January to 01 March, 2009. The project is entitled:

Identificación de oportunidades pare la promoción del sector minero en Bolivia.

or in translation:

Identification of opportunities of promoting the mineral resources of Bolivia

The final report is in Spanish. This report is an English version of the final report, published as a GEUS report with the permission of the Danish Ministry of Foreign Affairs.

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EXECUTIVE SUMMARY

Bolivia is gifted with numerous mineral deposits, some of which have been mined over the last five hundred years. Bolivia has been world leader in production of several commodities including tin, silver, antimony and tungsten, but since the 1980's Bolivia's importance on the international mining scene has dwindled, mainly because of the collapse in prices for some of the commodities, tungsten, tin and antimony. The same recession hit Bolivia's neighbours such as Peru and Chile, but the mining industry in these countries recovered, as opposed to Bolivia's.

Our investigations showed that some of the main obstacles are related to the following issues:

1. There is no transparent mining law. A non transparent mining law will deter the vast majority of international mining and exploration companies from even considering starting exploration or mining activities in Bolivia
2. For years, there has been confusion with regard to the extent of the state company involvement and the industry has experienced nationalisations of properties and tenure. A new mining code is in preparation and will imply that mining is undertaken by state companies, which then may decide to enter into contracts with foreign mining companies on a majority basis. The new code also prescribe that all exploration in Bolivia will be undertaken by state agencies only. Implication of this code will also make international mining companies invest in other countries with a normal market economy.
3. Bolivia has up to now shown very little interest in making data on mining and exploration easily accessible for the international community. Easy access to all geologic, geophysical, and geochemical data as well as results of previous mining and exploration activities is absolutely necessary in order to attract the interest of international mining companies. Data available so far has mainly been in Spanish. If Bolivia wants to attract international exploration and mining companies all data available on the internet must be in English.

Meetings with the key stakeholders, high-ranking civil servants up to the level of Vice minister, showed, however, that there is a good understanding and a thorough willingness to try to change the grave situation. Never the less, it appears that decisions have already been made on a higher political level to implement a new concept for sole state involvement in the mining industry. It is not clear how far the development of the new mining code has gone, and we understand that various views prevail among the institutions as to which type of encouragements will be most efficient, in order to boost the income from the mining industry.

The three key stakeholders, the Ministry of Mining and Metallurgy, Sergeotecmin, and COMIBOL has been inspired by the discussions during the mission to join forces on making a joint web portal for easy access to all relevant data. The Ministry has on behalf of the three stakeholders submitted a joint proposal to the Danish Embassy for this project. The Ministry has also submitted a project proposal to the Danish Embassy for support from foreign experts to formulate the mining code.

The mission identified environmental problems with regard to contaminated, acid, saline run-off water from the mines. Bolivia is in need of expertise to undertake the necessary research and development aiming at cost-efficient and low technology treatment technology. In addition, we learned that mercury used by a steadily increasing number

of small scale gold miners causes' health and environmental hazards. GEUS has expertise and experiences which may be relevant for the development of sustainable solutions to these problems.

Another target for this mission was to explore the possibilities of establishing a joint research project between Bolivian and Danish research groups a so-called ENRECA project. The University of La Paz (UMSA) has submitted a project proposal. This proposal will be subject to further inquiries; we will have to investigate if the relevant Danish expertise from the Geocenter Denmark can be made available. Deadline for the next ENRECA application is February 2010.

The final report was written in Spanish with the title:
IDENTIFICACIÓN DE OPORTUNIDADES PARA LA PROMOCIÓN DEL SECTOR MINERO EN BOLIVIA
The report in Spanish is a translation of the present report in English.

ACRONYMS

COMIBOL	Corporacíón Minera de Bolivia
DIMA	Direccion de Medio Ambiente
ENRECA	Enhanced research capacities
FOMIN	Fondo Minero de Inversión (Mining Investment fund for cooperatives)
GEUS	Geological Survey of Denmark and Greenland
IGEMA	Instituto de Investigaciones Geológicoas y del Medio Ambiente
Ministry	Ministerio Minero Y Metalurgia
MMM	Ministerio Minero Y Metalurgia
PRNMA	Programa de Recursos Naturales y Medio Ambiente. Cooperación Danesa.
SENARECOM	Servicio Nacional de Registro y Control de la Comercialización de Minerales y Metales
SERGEOTECMIN	Servicio Nacional de Geología y Técnico de Minas de Bolivia
U.A.T.F	Universidad Autonoma Thomas Frias
UMSA	Universidad Mayor San Andrés

INTRODUCTION

Bolivia has been a mining country for centuries and still has an excellent mining potential for a wide range of commodities. Best known is the silver from Potosi, which has been mined from 15th century and onwards. The most prosperous commodity for Bolivia is tin, which has been mined since 1861. In the beginning of the 1980's, Bolivia fell from the second to the fifth position among tin producers. Never the less, up to the late 1980s, tin still accounted for a third of all Bolivian mineral exports because of the strong performance by the medium and small mining sectors. In the late 1980's Bolivia also mined about a fifth of the world's antimony and was the leading producer among market economies, but the production of the metal gradually decreased after that. Also, for the production of tungsten Bolivia was among the leading producers on the market. However, a dramatic decline in the international tungsten prices in the 1980s severely hurt production, despite the large reserves. Many of the metals previously contributing significantly to the market economy of Bolivia today only provide a trickle of foreign currency into the country. During the past decade mining of zinc and gold have been the most important contributors to the income gained by the Bolivian mining industry, replacing the above mentioned commodities. Part of the problem has been drastically falling metal prices.

However, falling prices alone cannot be held accountable for the general decline of the mining industry of the country over several decades. When comparing the mining industry of Bolivia with neighbouring countries such as Peru and Chile, it is obvious that Bolivia is loosing ground, despite some striking similarities in the geological setting and minerals potential. The Bolivian mining industry has not been able to attract the international mining industry, despite the vast mineral resources.

In order to find new avenues towards reviving exploration and exploitation by foreign companies, COMIBOL and the Danish Embassy, La Paz, agreed to ask for a second opinion from the Geological Survey of Denmark and Greenland (GEUS). For this purpose, the GEUS team has met with key stakeholders and decision makers involved in mining and mineral promotion of Bolivia, to analyse why Bolivia is not more attractive to international mining investors. The key stakeholders met were the Ministry of Mining and Metallurgy, Sergeotecmin, COMIBOL, SENARECOM, and FOMIN, in addition to some of the mining operators in the Oruro district.

Finally, the GEUS team was asked to look into the possibilities of establishing joint research projects between Bolivian and Danish research groups, and has for this purpose met with representatives from three universities, and COMIBOL, the environmental office.

Mr. Ronald GJ. Boon, COMIBOL, PRNMA, has been the contact person during the mission and has liaised meetings and excursions.

ACTIVITIES UNDERTAKEN AND OUTPUTS PRODUCED

The tentative plan of meetings and activities has been developed ad hoc during the visit. It is our understanding that we have met with the key stakeholders and that we have received the relevant documents and information for the analysis of – some – of the problems in the mining sector – in particular those which are related the promotion of the mineral resources. In addition to the report we have provided a PowerPoint presentation of our main findings, analysis, conclusions and recommendation, for a concluding meeting with the Executives representing the government key stakeholders (Annex 6). Additionally, a note on what is regarded as international best practice with regard to mining code, have been developed (Annex. 7)

ACTIVITIES AND MAIN FINDINGS

Workshop for exchanging views among the stakeholders

A workshop was held on 21 January. Represented in the workshop were: The Ministry of Mining and Metallurgy, Sergeotecmin, COMIBOL, FOMIN, University of Potosi, UMSA Geologia, UATF, and GEUS. All organisations provided a presentation. Most of the PowerPoint presentations are shown in the annexes below. The aim of the workshop was for the GEUS staff to get an overall impression of the problems facing the mining industry and for GEUS staff to present some procedures and measures for mineral promotion applied elsewhere.

The following issues were aired in the workshop:
It is the view of the Ministry of Mining and Metallurgy, that the mineral promotion on the international scene is hampered by inadequate financial resources. Sergeotecmin has participated in a number of PDAC convents and has developed virtual library facility, and a number of brochures for varies prospects have been developed by the Ministry of Mining and Metallurgy. It was widely accepted by the participants of the workshop, that important information for investors in the mining business is too scarce on the web, - and available in Spanish only. The Ministry of Mines and Metallurgy has recently developed a new plan for promotion of mineral resources -“Reforma operative del marco institucional de las entidades del sector minero”; the plan is budgeted to c. 1.5 Mio. $ US. COMIBOL has circulated instructions to the government stakeholders that all mineral data should be regarded confidential and Sergeotecmin is required to submit their exploration data to COMIBOL.

COMIBOL is an autonomous agency, mandated to ensure the availability of the necessary mineral resources for Bolivia. The strategy is to attract foreign state companies, e.g. Chinese, for joint operations with COMIBOL. COMIBOL is in the process of organising a division for mineral exploration. Exploration used to be the sole responsibility of Sergeotecmin.

A new constitution was approved by a referendum on 25 January, implying that the Mining Act. 1777 will be revised.

Several attendants expressed the importance of long term ENRECA project, and it was decided to meet the relevant parties for further discussions.

Excursion to the Oruro District

An excursion was made to the Oruro district from 23-24 January. The team visited the following operations:

The Huanuni tin mine, operated by COMIBOL since 2002. The mine operation has been forced to employ c. 3,000 corporative workers from near-by operations, in addition to the 800 scheduled staff. The tin price is presently low, and consequently the mine runs at a loss. Major developments and a double capacity from the present (1200 t/d) is required to make the mine profitable. The mine is presently looking for investors.

Mine water and out-let water from the metallurgical plant runs off and no adequate water treatment has been established.

The Kori Kollo mine operation, is mining a low-grade gold resource by open pit operation, followed by a fully automatic in-situ leaching process. The representatives claim the operation follows all international standards for good mining practices. Presently the mining operation is put on hold, awaiting the outcome of the mining code revision prior to the decision of any further investments in the development of new areas. The mine is 85% owned by Newmont, and has been in operation since 2004.

Beremsa enterprise: This operation is re-cycling old tailings, with the aim to exploit the high Ag-content and to relocate the tailings as part of an environmental mitigation plan. It is the view of the consultants that the operation was very efficient due to highly committed staff and management, and that the concept should be considered for other tailings threatening the environment.

San José Mining Corporative: The corporative includes 435 members, mining silver and lead as main minerals, and zinc, tin and antimony as by products. The number of members has increased as a consequence of large unemployment rate, which has forced the corporative to register more members, despite the mine is not sufficiently developed for this extended operation. It was stated by the manager, that the members could hardly earn sufficient to sustain their families. Each member operates independently, but contributes to the cooperative by paying 6% of the revenue. The operation is characterised by almost total absence of technical background with regard to mining, safety, environment, and health risks. Moreover, the mine produces substantial acid drainage water. Research is required to find a cost-effective treatment plant for this water. It was reported that the poor income situation for corporative members makes it difficult for the members to change status from corporative to individual entities, as is the plan of the Ministry.

Meetings with the key stakeholders

Ministry of Mines and Metallurgy

The meetings with the Ministry mainly focused on the present and future legal framework forming the basis for promoting the minerals of Bolivia.

The mining code and its regulations are essential elements of the promotion of the mineral resources package. To date, mining is regulated by the Mining Code, law 1777, though unofficial changes have been made over the past couple of years, without subsequent amendments of the act (i.e. exploration by private companies no longer permitted). Moreover, it is difficult to get hold of copies of act 1777 – both digital and printed versions; we were unsuccessful in getting hold of the regulations.

During the second week, we learned that a new mining code, in consequence of the new constitution, is in the making. The management of the Ministry expressed the need for external assistances for the revision of the new mining code, and the Ministry has made a project proposal to the Danish Embassy for foreign experts to support the writing-up of the new mining code.

We understand that the new mining code will include the following principles: COMIBOL will be allocated the authority to operate and administrate all mineral rights. In essence, all future exploration and exploitation will be in joint venture with COMIBOL. Existing rights have one year for negotiations of new contracts with COMIBOL. From a promotional point of view these changes are of great concern to us, since they have proven unsuccessful in all other countries; Bolivia will certainly loose some of the potential investors, who will definitely go somewhere else.

COMIBOL (Corporación Minera de Bolivia)

Two meetings have been held with the COMIBOL senior management, from which the following information is extracted: Presently, c. 40 foreign exploration companies – mainly Canadian - have a concession, exploring for gold and base metals. The fairly complicated mineral concession application procedure was explained to us, applicable under law 1777. COMIBOL was of the view, that sufficient information is available on a CD developed by Sergeotecmin (price: 400 $ US), which is meant to be updated annually. The greater part of the country has not yet been geologically mapped in 1:100.000, and exploration reports have not been submitted; consequently, very limited data are available for geological exploration. The new mining code will include a clause on mandatory partnership with COMIBOL for mining operations, in which COMIBOL will be the lead party on carried basis. The strategy is to involve foreign state owned companies only. The new concept also implies that COMIBOL will be involved in all phases from exploration to mining, metallurgy and marketing, and COMIBOL does not see a need for foreign exploration companies any longer. The COMIBOL exploration budget for 2009 amounts to c. 10 Mio. $ US.

We explained that the general trend in the Western World is that private exploration- and mining companies take the risk of investing in exploration. If the company finds a mine able deposit then a negotiation takes place between the company and the government along the lines stipulated in the mining law. In the event of unsuccessful exploration efforts the companies have spent a lot of money in the country in logistics etc., which contributes to the local communities in terms of employment and investments.

Sergeotecmin (Servicio Nacional de Geologica y Técnico de Minas)

Two meetings have been held regarding: (i) The virtual library and the promotion activities undertaken: The virtual library was demonstrated, and seems to contain substantial data. Regrettably, the reports are not geo-referenced and data are available in Spanish only. We understand that Sergeotecmin will consider how best to update the database to fulfil such requirements. For unknown reasons the commercial CD has not been updated since 2005. (ii) The mining cadastre unit, established in 1997 simultaneously with the promulgations of the Law 1777, was presented, and we were left with the impression of a well organised and up to standard unit, which regrettably is not available on the internet. We received the annual report for year 2007.

Seneracom (Servicio Nacional de Registro y Control de la Comercialización de Minerales y Metales)

SENERACOM (Servicio Nacional de Registro y Control de la Comercialización de Minerales y Metales) is a semi-autonomous agency under the Ministry of Mines and Metal-

lurgy, with the aim to gain control of the mineral commodity export, and to generate statistical data on the export. The organisation starts operation per 1 February this year.

FOMIN (Fondo Minero de Inversión)

FOMIN (Fondo Minero de Inversión): Is a mining investment fund for cooperatives, supposed to provide up to date technical-, managerial- and financial support to the co-operatives, with the long term aim to enhance the income for the benefit of the societies and to reduce the negative impact on health and environment. FOMIN commenced operation in 2003, but have to date not entered any credit arrangements. FOMIN expressed strong interest to establish cooperation with foreign consultants.

Promotion activities/efforts

No general promotion strategy for the mineral resources of Bolivia has been developed. Promotional efforts have therefore taken different routes over the past years: (1) Some of the stakeholders have tried to promote exploration projects, and to attract junior exploration companies; (2) others held the view that exploration should be undertaken by COMIBOL/Sergeotecmin only, and promotion should be directed towards large (State-) mining companies only. The key stakeholders have therefore produced their own institutional material, like hand-outs and descriptions of some of the best known prospects, but now reach the conclusion that it has been of little use, and no network of investors have been developed. Sergeotecmin has participated in two PDAC conferences, but found that it gained only little interest.

A few years ago Sergeotecmin was involved in a Canadian funded project developing a virtual library (www.Sergeotecmin.gov.bo, www.mineria.gov.bo, www.geoinformacion.gov.bo). These websites are not easily recognised by the search engines and the information is mainly in Spanish. We understand that CIDA is contemplating to finance a second phase of the development of the virtual library.

All stakeholders have expressed the need for more mineral promotion and agreed to the proposal setting up a joint-ministry web platform. A joint work-group was established during our stay, and a work proposal and attached budget was developed. The group expressed the urgent need for an external consultancy, (i) to solve the data-sharing problem, and (ii) to advice on best practise within this field. The Danish Embassy, La Paz, has been approached for potential funding of the promotion website.

The Yemen on-line facility was presented, allowing also the user to develop metallurgenetic maps, which inspired a frank discussion among the institutions regarding which of the institutions should be responsible for the database and what type of data should be included. We suggested a widely applied approach – namely that all major stakeholders have well defined responsibilities with regard to providing data to the web platform, irrespectively of where it is hosted.

Potential projects for ENRECA proposal

University of Oruro, Department of Mining Engineering, is staffed by 14 teachers and has c. 200 students for a five years training (equivalent to BSc). They have experi-

enced fluctuations in student intake following the metal price's impact on the mining sector. It has been difficult for the school to renew the professional staff, so most of the teachers are approaching retirement. The school does not provide training on MSc/PhD level. The representatives expressed strong wishes to modernise the institute in cooperation with foreign experts; in particular they would like to strengthen the issues related to environmental aspects of mining.

Universidad Mayor De San Andrés (UMSA), Instituto De Investigaciones Geologicas Y Del Medio Embiente (IGEMA), is staffed by 13 teachers/professors and has c. 200 BSc students; IGEMA provides training in almost all geological disciplines. C. 8 students graduate annually (BSc) after 5 years of training, and are subsequently employed by the mining industry, government and municipalities. The labs are equipped with instruments stemming 10-20 years back from previous development projects, and except for the microscopes, replacements/upgrading are urgently required. IGEMA has ongoing research within the fields of mining, water resource, climate change, and general geology. The two representatives expressed a strong interest to participate in an ENRECA project. The IGEMA has subsequently submitted two potential project proposals aimed for ENRECA framework cooperation.

Representatives for University of Potosi, expressed an interest to participate in an ENRECA project. A scheduled follow-up meeting failed, due to logistic constraints.

Representatives for COMIBOL expressed an interest to develop a joint project with foreign partners to solve the problems of acid, saline, and metalliferous run-off water from mines and tailings. There is a strong need for low-technology and cost-efficient treatment plants.

ANALYSIS

Mining Code (Law no. 1777)

The Mining Code, Law No. 1.777 of 17 March 1997, regulates activities relating to prospection, extraction, processing, smelting and marketing of minerals. The Mining Code (Law no. 1777) was an attempt to respond to the Government's shift toward open-market policies. According to the provisions of the Mining Code, minerals belong to the State, which, through the Executive, grants mining concessions to Bolivian or foreign individuals or collective persons requesting them. A mining concession is a transferable property, which (subject to the payment of royalties) gives the owner a right to prospect or explore for minerals and to conduct operations, process, smelt, refine and market minerals for an indefinite period. The priorities between the land rights and the mining rights are not defined. We find the act. no. 1777, inadequate to cope with modern mineral regulation procedures, and those amendments are justified. Some of the issues are dealt with below.

Obtaining of rights. The procedure for issuing concessions requires that the applicant first visit the cadastre office (Servicio Tecnico de Minas at Sergeotecmin), and subsequently visits the Superintendency of Mining for payment of 'patentes mineras'. The first office is checking whether the area in question is free and that no overlap with other concession areas occurs. The procedure applied in case of need to handle competing applications covering the same or overlapping areas, is not clear to us but apparently, the widely accepted principle "first come first served" does not necessarily apply.

Types of licenses. Under the Mining Code (no. 1777) all mineral resources on surface and sub-surface are property of the state. Mining concessions granted by the State confer the rights to exploit mineral commodities, but the right of ownership still belongs to the State. The Mining Code operates with only one type of concession – mining rights - as opposed to the more usual distinctions between prospection, exploration, and exploitation. Also, the concession does not specify types of minerals; only radioactive minerals are exempted.

Criteria for granting rights. It appears that concessions are granted on objective criteria, since only two criteria are required: (i) The applied area must be available and no overlap with existing rights (and a few other specific criteria regarding proximity to the national border, townships, churches etc.) must exist, and (ii) that the 'patentes mineras' are paid. However, when a state partnership is required, the granting of rights is no longer on objective criteria; it is not clear to us, exactly when the investor may be met with such a request.

Exclusive right. The Act 1777 does not distinguish between different rights, and all concessions therefore have exclusive rights.

Security of the tenure. We are uncertain if the tenure is secured: On the one hand, Act 1777 grants a concession right to all phases from exploration to exploitation, and thus the tenure is secured. On the other hand, it seems that COMIBOL may have the right to at some point to request a partnership – on carried basis - in return for a mining lease. If this is the case, the tenure is not secured. Under the new mining code, this is

no longer an issue, because all exploration will be undertaken by the State, and mining will be the responsibility of COMIBOL, who will invite partners to participate on contract basis. Such uncertainty is prohibitive for development of a mining sector investment climate.

Free transferability of mining titles. Mining rights can be transferred and mortgaged without limitation.

Simple financial maintenance requirements. Act 1777 is unique in the sense that 'patentes mineras' are the only fee to be paid. The fee remains fixed for the first five years (125 Bs/Ha.) and 250 Bs/Ha for the subsequent years.

Relinquishment requirement. Act 1777 does not require relinquishment of any part of the concession, and concession is not time limited. This carries the risk that the license holder does not undertake exploration.

Annual reporting obligations. Act 1777 – as well as previous acts – does not instruct the licensee to submit annual progress reports. Consequently, such important data are not available for future exploration.

Annual obligations for exploration. Act 1777 does not require any exploration obligation, and no other incentives for exploration have been put in place, ensuring that the holder of the license undertakes his utmost to delineate potential mineral resources.

License period. Act. 1777 does not prescribe time limitations to the concessions. Modern acts prescribes time limited rights.

Indigenous people. Modern mining codes normally encompass paragraphs regarding the rights of the indigenous people living within an area under concession. Act. 1777 does not provide any guidelines for such conditions.

Environmental aspects of exploration and mining. Act 1777 provides only very weak and general directions concerning environmental protection. A mining code cannot be very specific but should refer to the Environment Regulations, in which all conditions from exploration to mining should be spelled out, often starting with an Environmental Impact Study.

Revision of the mining code

A new constitution of Bolivia was approved in a referendum held on January 25, 2009. The new constitution implies that dramatic changes in the mining code will be made replacing Act 1777. The new mining code will govern throughout the production chain. Some of the key points in the new mining policy are as follows:

- Natural resources are the property of the Bolivian people.
- The industrialisation and marketing of natural resources will be a priority of the State.
- The State will be involved throughout the process from prospecting, exploration, exploitation, industrialisation, and caretaking of information and geo-scientific data regarding the mineral resources of the country.
- The mining cooperatives sector will be strengthened.
- Private companies, Bolivian or foreign, can only enter into mining activities, if a contract with COMIBOL has been established.
- Consultation with indigenous peoples becomes mandatory standard.

- Existing mining rights are respected for one year; after this period, all concession holders are forced to migrate to state contracts.
- Projects must ensure an adequate environmental management.

Fiscal Reserve will be declared throughout the national territory, comprising all the mineralogical metal, non-metals, evaporites, precious and semiprecious stones, and brines; the State allocates to COMIBOL the power and authority of its operation and administration - except the mining rights granted under the Mining Act 1777, and except for aggregates that are under municipal jurisdiction.

Mining concessions granted to foreign and national companies prior to the promulgation of the new Constitution will be forced to enter into new the mining contracts within one year after the approval on the new Mining Code. The State shall participate in the industrialisation related to metallic and non-metallic resources. Mining plants and smelters cannot be privatised. It is also understood that mining concession rights provided by mining contracts, are not transferable, and that the COMIBOL conditions for entering the new mining contracts will be a 55% share to COMIBOL, on a carried basis. We are on the view that these steps will impact the investment climate within the mining sector negatively in the year to come – even beyond that potential point in time, if Bolivia one day again decides to regulate the mining industry along modern and internationally accepted mining codes.

The Ministry has developed a Sector Plan, covering the period 2008-15, based on 10 programmes and 71 projects. The plan anticipates a total investment of 3.6 Bio. Bolivianos, over the eight-year period; c. two-third is assumed contributions from risk capital investors. We have no information on the type of programs and projects involved in the plan, but we have our concern if a plan based on an investment scheme involving major state participation on a carried basis, will actually work. More competitive investment schemes in the international mining sector are offered elsewhere.

It is the aim of the Government of Bolivia via the new mining code and planned activities to develop mining into a strategic sector and engine for more general developments, which will generate economic surplus. We also understand that it is the expectation that through involvement of COMIBOL, the cooperatives and the communities, social organisations with decent jobs can be created. In our view, there is a real danger that the new concept more likely will scare off than attract the international mining sector. If that happens, the visions of the government will not come true.

Statistics of the mining activities

A global crisis hit the mining industry in 1997-98, and a subsequent booming economy returned in 2004, but Bolivia did not manage to recover investor interests, as illustrated in Tab. 1 and fig. 1. Three of the regions take up more than 80% of the mineral concession areas: Potosi (39%), Santa Cruz (23%), and La Paz (19%). These figures support the view aired in the workshop by one of the stakeholders that large areas of Bolivia is under explored.

Table 2 shows that almost 50 % of the concessions in Bolivia are hold by individuals. In most countries only registered entities can apply for a concession, which is meant to ensure that the company possesses the adequate technology and financing to undertake exploration/mining. The large number of individual concession holders in Bolivia may well indicate that most of these concessions are dormant; thus, the country does not benefit from such concessions.

Table 2 shows that the mining industry in Bolivia is bimodal, dominated by many small players and very few large scale operations.

Concepto	Concesiones Mineras		% sobre
	Numero	Extensión	Superficie Bolivia
Precatastro (Ano 1995)	60.689	11.066.573	10.07
31 di diciembre 1997	8.651	4.767.191	4.34
Febrero 2008	4.179	533.325	0.49
Mayo 2008	4.111	527.371	0.48

Table 1. *Concesiones Mineras por pertenencias (Source: Sergeotecmin)*

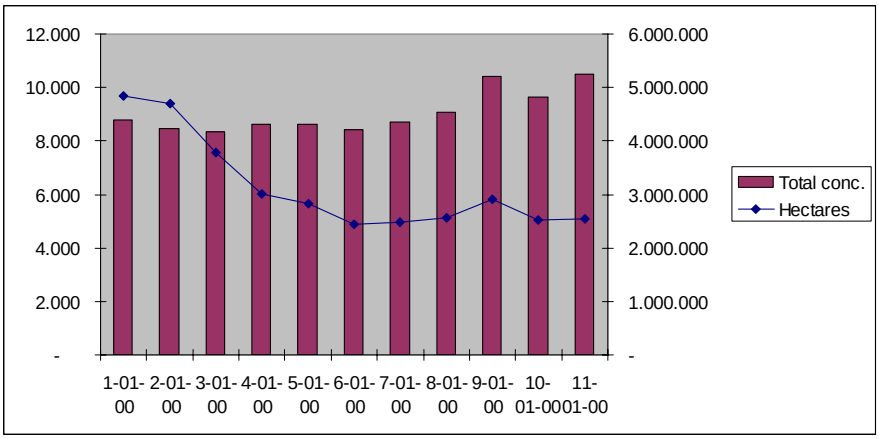

Figure 1. *Total concesiones por pertenencias y por cuadriculas.(Source: Sergeotecmin)*

Grupo	Concesiones	Has.	%
COMIBOL	2,118	325,176	12,7
Cooperativs	307	28,987	1,1.
Empresas	1,949	952,401	37,3
Unipersonales	6,133	1,245,707	48,8

Table 2. *Distribucion de concesiones por grupos, 2007 (Source: Sergeotecmin)*

The ´patentes mineras´ has increased ten times over the ten years period from 1997-2007 (2.5 Mio. Bolivianos and 26.6 Mio. Bolivianos respectively). The amount paid in 2007 is equivalent to c.10 Bs per hectares under concession, which seems a very low figure. A certain percentage of the 'patentes mineras' returns to the administrative region under which the concession area belongs. From this it follows, that in particular the three departments Potosi, Santa Cruz and La Paz benefit from this arrangement.

The structure of the governmental institutions responsible for mining issues

The Ministry of Mines and Metallurgy is responsible for drafting and implementing policies on prospection, exploration, operation, processing, beneficiation, smelting and marketing of minerals and metals and the promotion of investment, as well as on basic and applied metallurgical research. The Consejo Nacional de Minería (National Mining Council), established in January 2004 is a standing consultative and advisory body for the Government in relation to mining policy. The General Superintendency of Mines is the highest administrative authority and settles disputes in the mining sector. The regional superintendence offices have initial responsibility for granting concessions and settling disputes in their respective areas. These offices seems not linked to a common mining cadastre database. However, after the implementation of the new mining code system this administrative system seems to become superfluous.

The Mining Industry

The role of COMIBOL was in the eighties changed to administer and rent the nationalized mining properties, by calling for tenders and subsequently signing exploration- and exploitation Joint Venture contracts. This role has gradually been changed over the past ten years, and COMIBOL is now responsible for the running of some of the State-owned mines.

The private mining sector comprises the small, medium and cooperative mines. The medium miners are associated to the Medium Miners Association; private small miners are associated to the National Mining Chamber (Camara Nacional de Mineria); and the corporatives are grouped under the National Confederation of Mining Cooperatives (Federacion Nacional de Cooperatives Mineras – FENCOMIN).

The present global crisis has hit Bolivia and tends to deepen the problems in Bolivia with regard to further diversification of production and development of technology. Moreover, it generates unemployment, impoverishment and migration.

Income generated by the mining industry

Table 2 shows that the structure in the mining sector has changed over the past twenty-seven years: In the eighties tin used to be the main source of income in the mining sector, but since the nineties both gold and zinc became the most important mineral commodities. In 2002, the foreign direct investment (FDI) in the mining sector was already at its lowest level ($ US 11.6 Mio) since at least 1996. But in 2003, FDI in the mining sector nearly doubled to $ US 20.5 Mio; it increased to $ US 44 Mio in 2004, to about $ US 183 Mio in 2005 and c. $ US 252 Mio in 2006. Thus, investment by foreign-based private mining companies increased by about 37% in 2006 despite various Government announcements in favour of nationalisation of the mining sector. We presume this should be put in the context of the very high prices for mineral commodities these years.

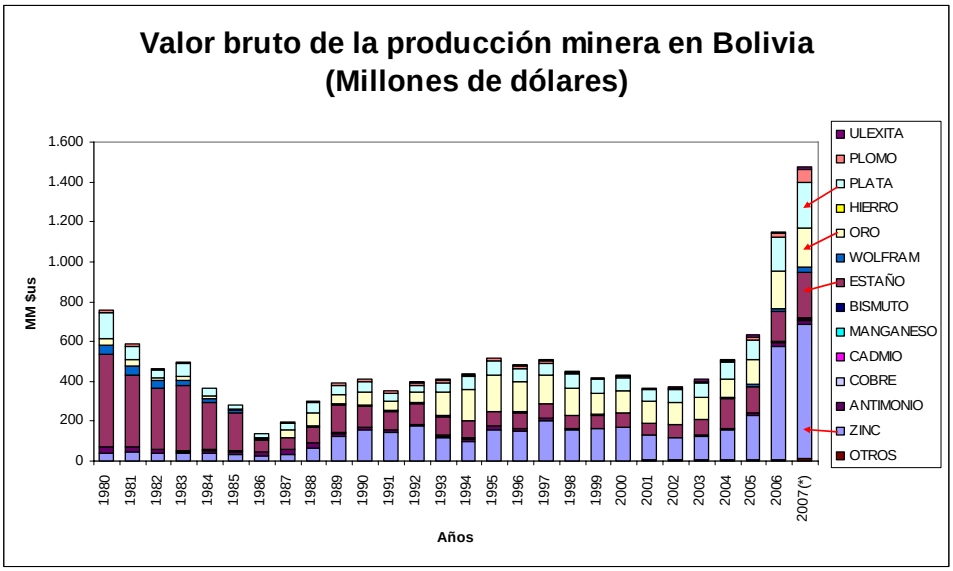

Figure 2. *Valor bruto de la produccción minera en Bolivia (Mio. $ US). The increasing production value correlates with increasing commodity prices, and does not express increasing productivity. (Source: Ministry of Mines and Metallurgy*

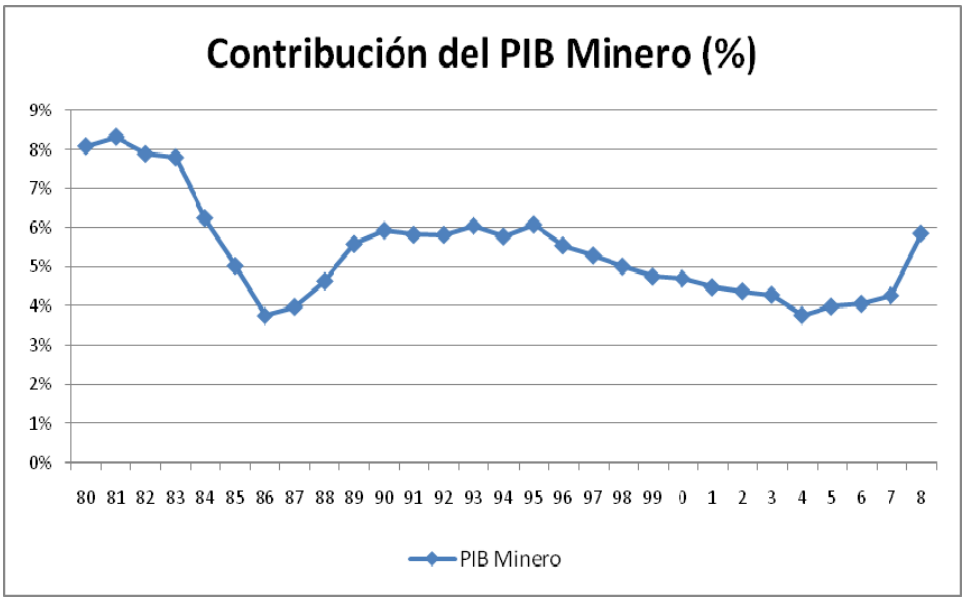

Figure 3. *The contribution of the mining industry towards PIB has steadily decreased over the past two decades, and amounts now to less than 6% - prior to the recent decline in world market prices.*

Promotion of mineral resources of Bolivia

Based on the meetings held with the Ministry of Mines, COMIBOL, and Sergeotecmin, it is obvious that the mineral resource promotion efforts of Bolivia have not been adequately coordinated, and no concerted actions have been undertaken. Each institution has made its own effort to promote the minerals – and themselves. COMIBOL and Sergeotecmin used to split their responsibilities – COMIBOL promoted the mines, and made an effort to attract large scale companies, in particular state mining companies,

and Sergeotecmin focused on the exploration industry. It also appears that the will among the institutions to join forces and to share data have been limited.

Despite the implementation of the new mining code will change the necessary focus of the mineral promotion activities, we would like to offer our view as to some of the promotion efforts undertaken.

Ministerio de Minería e Hidrocarburous has developed 16 one-two pages factsheets on some of the most prosperous mineral projects:

- Ministerio de Minería e Hidrocarburous has made a number of one to two page fact sheets:
- Sonia Susana Prospect (Au-Ag)
- Turaquiri prospect (Ag)
- Salinas de Garci Mendoza District (Au-Ag)
- Chinchillhuma Prospect (Au-Ag)
- Panizo prospect (Au-Ag)
- Loma Llena prospect (Cu-Pb-Zn)
- Ixiamas District (diamonds)
- Titicayo prospect (Ag)
- San Vicente project
- Ayopaya alkaline province, Cochabamba, Central Bolivia: Prospective area for diamonds
- Japo tin ore Oruro department, Western Bolivia
- Ubina polymetallic (Ag-Au-Sn) district Potosi department, Southern Bolivia

We find the above fact sheets informative, although more details would be useful for the reader. Companies operating on the international scene need e.g. assay results or drill intersection, before they will seriously consider further investigations.

It is not enough to produce good information material; it also has to reach the potential investor. How should such fact-sheets be distributed? We would recommend doing it through participation in international exploration and mining exhibitions. We find the event organised by the Prospectors and Developers Association of Canada (PDAC) held in Toronto once a year, very useful, if the target for the promotion really is the international mining industry.

We understand that Sergeotecmin a few years ago participated in the PDAC event, but felt that they did not receive much feed-back. We believe this may mainly have been due to homework not done thoroughly e.g. an attractive easy accessible web site. Of course, the overall knowledge of exploration and mining conditions in Bolivia may just be unappealing to the international mining industry. Certainly, a great number of studies show that a reform of a country's mining laws into something at par with modern international best practice is a clear pre-requisite for attracting the international mining community. Next, an easy- to-find country web site, enabling download of all relevant information, is mandatory. In case the visitors at PDAC gain interest in the mineral potential of Bolivia, they should have the immediate option to download more information about the geology, the exploration projects, mining projects, the mining code, how to apply for a concession, the investment schemes, and list of companies working in the a country etc.. If they do not find this information or if they find the mining code and/or the investment schemes to be non-transparent or just generally non-competitive, the investor will look for opportunities in another country. The international competition for necessary investment is fierce, even more so now after the global crisis has engulfed us.

There is no one-point-of-entrance web-site to promote the Bolivian minerals potential. Moreover, the available websites are not easy to find, and the majority of them are in Spanish only. Some examples: (1) A search for "*Bolivia geological survey*", does not catch the website of Sergeotecmin or any other relevant Bolivian website. (2) A search for "*COMIBOL*" does catch the website www.comibol.gov.bo, but that site is not accessible. (3) A search for "*Bolivia mining code*, does not catch neither the cadastre unit nor websites providing the mining act and its regulations, and (4) a search for "*Bolivia mining investment scheme*" does not catch any web-site provided by the Bolivian authorities.

The useful, virtual library website developed by Sergeotecmin, is indeed very difficult to find. It should be mentioned, that this web-site has an English facility, though the bottom to click is difficult to spot. Unfortunately, most of the reports are in Spanish, but we understand that Sergeotecmin intend to find the means of having at least summaries and tables translated into English. Next important step would be to get the reports in the virtual library geo-referenced, so interested groups could relate to the whereabouts in Bolivia.

Sergeotecmin has produced a CD entitled: *Bolivia Promotion of the mining sector*, which in several meetings have been referred to as the key information for potential investors; the CD is meant to be updated annually. The downside of the effort is that the investor (i) has to be aware of the existence of the CD, (ii) has to pay a visit to Sergeotecmin to obtain it, and (iii) has to pay 400 $ US. Regrettably, he will then find that it is all in Spanish and that no update has been made since 2005. An updated – and bilingual Spanish/English version – would indeed be very useful for promotion exhibitions and conferences.

For promotion purposes COMIBOL has produced a brief compilation of the history of COMIBOL containing photos and a few maps. Information is given about the start of COMIBOL, with a description of the Corocoro hydrometallurgical project, etc. It is in both English and Spanish and will make an interesting addendum for a future PDAC participation of Bolivia.

The website of the Ministry of Mining and Metallurgy states that it is the plan of the Ministry to transform the mining industry in such a way that the State becomes responsible for managing the entire mining value chain. This would be in order to better achieve the desired industrialization of the resources, to boost the production capacity, and to improve the government control- The overall aim is to ensure a larger income from the mining industry. In our view, this message is in strong contradiction to the promotion efforts carried out elsewhere in the Ministry; it will most likely have a prohibitive impact on possible future mining investments in Bolivia.

A significant outcome of the mission was the Ministry of Mines and Metallurgy, COMIBOL and Sergeotecmin decided to join forces and produce one web portal for promoting the mineral resources of Bolivia. Each stakeholder would be responsible for their contribution, but all contribution should be uploaded on one web portal.

The need for enhanced research capacities

The team has met with representatives of the three universities training mining engineers and geologists.

The University of Potosi: This was a very brief meeting during in the workshop, from which it transpired that the geological department of the university would be very interested to participate in an ENRECA project. Regrettably, a scheduled meeting did not materialise, and no more details are therefore available.

The University of Oruro, the Mining Engineering Department: Recruitment of students to the department escalates with the development of the mining sector; in booming periods, the number of students increase and visa versa. However, it has not been possible to secure a re-generation of the academic staff. The head of the department therefore considered involvement in a potential ENRECA project to be a great opportunity for a general capacity building enhancement. The training offered is a five years BSc-type of education, but the management has considered if MSc-training could be established. A scheduled meeting for more detailed discussions did unfortunately not come on.

University de San Andrés (Universidad Mayor de San Andrés – UMSA), the Faculty of Geological Science (IGEMA): The faculty expressed a keen interest to cooperate with Danish universities/agencies in order to enhance their capabilities. Presently, the students graduates after five years on a BSc level, but the faculty is planning to introduce MSc-courses next year. It was concluded in the meeting that the faculty should develop a potential proposal for a joint ENRECA project.

COMIBOL/PRNMA: This environmental unit of COMIBOL has over the past five years been involved in environmental aspects of mining – in particular the mines operated by the corporative – and has identified contaminated, salty, and strongly acid mine water to be of great concern to the environment. We understand that more research is required in order to develop cost-efficient/low-technology plants for the run-off water from numerous abandoned and active mine sites. The representatives expressed the need for formalised MSc-training related to this problem.

The project proposals (Annex 8) seem all relevant to us. However, we will need to discuss the research topics with our colleagues at GEUS and within the Geocenter Copenhagen, in order to identify the available expertises and to learn about their comments. Based on these consultations we will later report our findings and recommendations.

Mercury pollution from small-scale mining

In Bolivia small-scale gold mining prevails in the Amazon part of the country. Tens of thousands of miners extract gold with serious environmental implications. The most serious environmental hazard is caused by the extensive use of mercury in the extraction of gold (amalgamation). Amalgamation causes obvious long lasting environmental and health problems.

GEUS has worked for several years in different parts of the world on introducing improved gold extraction methods for small-scale miners. Recycling of mercury has proved successful. However, methods not using mercury at all are not in focus. The so-called borax method was invented in the Philippines twenty years ago, and is now widely used in that country. Other countries are in the process of implementing this technology for the benefit of health and environment. The borax gold extraction is a fairly simple non-toxic method which requires a minimum of technical expertise. GEUS has been involved in a number of such projects and have strong expertise with the field of training small-scale mining in this technology. Details are given in Annex 9.

CONCLUSIONS

A successful promotion of mineral resources requires that certain conditions are fulfilled. It is our view that some of these conditions are not in place in Bolivia:

Bolivia is presently in a transition period replacing a very liberal mining code with a socialistic concept of mining code, including also nationalisation of the mining industry. Although details are not known on the new mining code the following two elements in the new mining code will deter the international exploration- and mining communities from coming to Bolivia:

- Private companies, Bolivian or foreign, can only enter into mining activities, if a contract with COMIBOL has been established.
- Existing mining rights are respected for one year; after this period, all concession holders are forced to migrate into state contracts.

Such changes in the mining code concept will have a long term negative impact on the mining investment climate. It should be noted here, that despite a liberal mining code and an interesting mineral potential Bolivia has not been able to attract the mining industry, which we believe reflects the fact that the investors find the political system fragile, and thus overall do not find Bolivia sufficiently attractive. The planned changes may well have a further prohibitive impact on potential mining investments.

The attempts to promote the Bolivian mineral resources have not been successful, due to the above circumstances but also because limited geological information is available on the web for the investors. The information is difficult to find, and most data are in Spanish. The policy is to charge potential investors for the geological data will also deter future exploration companies of investing in Bolivia. All together, this does not make Bolivia rank high on the ´list of competition´ for potential mining investors. The well known fact, that Bolivia has an outstanding mineral potential for wide range of mineral commodities is not sufficient to change this ranking. However, if the conditions are adjusted to internationally accepted standards, the future of the Bolivian mining industry may probably become quite prosperous.

The Bolivian universities do not provide MSc- and PhD training courses in geoscientific-, environmental-, and mining engineering subjects. In order to ensure the development of Bolivia's mining sector it is essential to include advanced training in relevant subjects. We find that ENRECA may be an appropriate instrument for the enhancement of certain aspects of the geosciences and for capacity building purposes. We find the projects proposed by the Bolivian participants in this project could be of great mutual interest. Within the next couple of months GEUS will forward findings and conclusions on this subject.

COMIBOL pointed to the environmental hazard caused by the widely spread sources of contaminated, acid, saline water from old mine sites and tailings. A long term technical solution to this problem has not been identified. COMIBOL has requested assistance to find technical and cost-efficient technologies solving the problem. The potential relevance of this issue in an ENRECA context as well as in relations to other routes for funding will be assessed by GEUS.

We understand that Bolivia over the past decade has experienced serious environmental problems due to the small-scale miner's use of mercury for the amalgamation process of gold concentrates. Alternative technologies should be implemented.

RECOMMENDATION

Given that the new concept for the mining industry will be based on state involvement from exploration to mining, little room is left for promotion of the mineral resources of Bolivia. We find, however that the recommendations below may contribute to improving the income from the mining sector in general and also may contribute to the enhancement of the institutional capacities within geo-sciences and environmental aspect related to mining:

- Try to ensure that the new mining code system balance the national requirements but also is competitive with that of other countries. This requires that (i) all licensing procedures and regulations are absolutely transparent; (ii) the tenure is secured; and (iii) a transparent fiscal and tax system is established.
- Make all relevant technical- and legal data easily available. This include: (i) Development of a one door web portal, operated jointly by MMM, COMIBOL and Sergeotecmin. (ii) All data - unless confidential - should be made open to the public, should preferably be in English, and should be geo-referenced.
- Use brochures and hand-outs of mineral occurrences which are assumed to attract the interest of the mining industry.
- Participate in essential mining- and exploration conventions, e.g. PDAC.
- Concerted, joint actions among the key stakeholders are essential.

The Bolivian representatives expressed the wish that external consultants could be involved in the above development. We also find there is a need for easy and frequent access to discussion partners and technical expertise on selected topics.

The mission has identified the need for enhancement of the training/capacity building within the subjects related to the geosciences as well as environmental aspects related to mining. We recommend that further investigations are undertaken towards a joint Bolivian-Danish ENRECA project.

It is recommended to investigate further if the GEUS expertise within introduction of alternative technology to mercury for use in small scale gold mining can be applied in Bolivia.

ANNEX 1 Terms of Reference

TERMINOS DE REFERENCIA
CONSULTORIA INTERNACIONAL

INSTITUCIÓN:	CORPORACIÓN MINERA DE BOLIVIA (COMIBOL)
PROGRAMA:	PROGRAMA DE APOYO AL DESARROLLO SOSTENIBLE, GESTION DE RECURSOS NATURALES Y MEDIO AMBIENTE EN BOLIVIA
COMPONENTE:	PREVENCIÓN, CONTROL Y MITIGACION DE LA CONTAMINACION DEL SECTOR MINERO - COMPONENTE 3
CONSULTORÍA:	ELABORACIÓN DE PROGRAMA DE INVESTIGACION ENRECA

1. ANTECEDENTES

En abril de 2002 se conformo la Dirección de Medio Ambiente (DIMA) en la Corporación Minera de Bolivia (COMIBOL). Los principales tópicos de intervención de la DIMA son la mitigación de los impactos ambientales generados en sus concesiones mineras (pasivos mineros), la prevención de la contaminación ambiental por las actividades mineras en operación y la responsabilidad social.

Para la implementación de las actividades de la DIMA se cuenta desde el 2002 con el apoyo de la Cooperación Danesa. El 2005 fue aprobado por el gobierno danés la segunda fase de cooperación denominado *"Programa de Desarrollo Sostenible, Recursos Naturales y Medio ambiente (PRNMA)"*. El convenio gubernamental del Programa fue suscrito en marzo de 2006 por el gobierno boliviano y el gobierno danés, el cual fue promulgado mediante Ley de la República No. 3124 el 12 de junio de 2006. El PRNMA tiene previsto su ejecución entre el 2006-2010.

Como integrante de este Programa se encuentra el Componente 3 denominado "*Prevención, Control y Mitigación de la contaminación del Sector Minero"* que tiene como entidad ejecutora a la COMIBOL.

El objetivo de desarrollo planteado para el Componente 3 es:

- Contribuir a la reducción de la pobreza y mejorar la calidad de vida en zonas y comunidades mineras bajo conceptos de prevención, control, y mitigación de la contaminación originada por actividades mineras tanto del presente como del pasado

Para el cumplimiento de este objetivo se tienen cuatro objetivos inmediatos que se detallan:

Objetivo inmediato 1:	La gestión socio ambiental se ha institucionalizado en COMIBOL
Objetivo inmediato 2:	Se ha disminuido en 10 centros mineros la contaminación generada por los pasivos mineros coadyuvando a mejorar la producción agropecuaria y la salud de la población en forma costo eficiente.
Objetivo inmediato 3:	Disminuida la contaminación generada por las cooperativas y otros operadores mineros coadyuvando a mejorar la producción agropecuaria, la salud de la población; bajando la tensión social entre mineros y agricultores.
Objetivo inmediato 4:	Calidad de vida mejorada coadyuvando a la reducción de la pobreza en los centros mineros con énfasis a mujeres y niños – Plan Mujeres Mineras

Para fortalecer las capacidades del sector minero en Bolivia la COMIBOL ha solicitado al Servicio Geológico de Dinamarca y Groenlandia (GEUS) apoyo. Para definir los posibles alcances de la colaboración entre Dinamarca y Bolivia se tiene previsto un acercamiento mediante una visita de una delegación de GEUS a Bolivia en el primer trimestre de 2009.

OBJETIVO DEL CONTRATO

Identificadas las oportunidades de colaboración entre Dinamarca y Bolivia para el sector minero que refleja las experiencias en actividades mineras de Dinamarca y las necesidades del sector minero en Bolivia.

2. RESULTADOS ESPERADOS

1. Se han concertado las instituciones Bolivianas del sector minero sobres sus expectativas de colaboración con Dinamarca, que incluyen la COMIBOL, el Ministerio de Minería y Metalurgia, SERGEOTECMIN, universidades de la Paz, Oruro y Potosí.
2. Se han tomado conocimiento de la geología y minería de Bolivia
3. Se han definido un programa de cooperación que será presentado al ENRECA

3. ACTIVIDADES DEL TRABAJO

El consultor, entre las actividades a desarrollar deberá efectuar:

Para el resultado 1:

- ✓ Taller de intercambio al inicio y al final de la misión con representantes de COMIBOL, el Ministerio de Minería y Metalurgia, SERGEOTECMIN
- ✓ Reuniones con representantes de las entidades seleccionadas

Para el resultado 2:

- ✓ Reuniones sectoriales con COMIBOL, el Ministerio de Minería y Metalurgia, SERGEOTECMIN
- ✓ Visita a campo al centro minero de Huanuni, Kori Chaca, BAREMSA, y San José.
- ✓ Visita a la carrera de geología de la UTO
- ✓ Revisión de bibliografía geológica de Bolivia

Para el resultado 3:

- ✓ Revisar oportunidades de colaboración, incluyendo ENRECA
- ✓ Explicar a las autoridades del sector minero los lineamientos para programas de cooperacion, incluyendo directrices del programa ENRECA
- ✓ Presentar opurtinidades de colaboración a las autoridades del sector minero boliviano

5. COORDINACIÓN

El equipo de GEUS coordinara todas sus actividades con el director de Medio Ambiente y el responsable de la prospección de la COMIBOL, además con representantes del Ministerio de Minería y Metalurgia y SERGEOTECMIN.

6. DURACIÓN Y LUGAR DE TRABAJO

El tiempo marco para esta consultoría será de 17 días por cada consultor que contempla dos dias de viaje, una misión de 10 dias en Bolivia, y 5 dias para elaboración de los informesde. La misión está prevista para el primer trimestre de 2009.

7. PERFIL DE LOS CONSULTORES INTERNACIONALES

Para la consultaría se tiene prevista dos expertos con el siguiente perfil:

- Geólogo senior
- Mínimo 10 años de experiencia en prospección y exploración minera
- Amplia experiencia en preparación y promoción de proyectos mineros bankables
- Experiencia en la elaboración de políticas mineras para atraer inversiones para exploración y explotación minera

8. PRODUCTOS ESPERADOS DE LA CONSULTORÍA

- Informe de misión
- Informe con los siguientes temas:
    - oportunidades de cooperación, incluyende posible perfil de proyecto
    - posibilidades de financiamiento
    - sugerencias como promocionar los recursos mineralogicos de Bolivia

9. IDIOMA

El idioma de trabajo y los informes de la consultoría, será el español.

La Paz, noviembre 2008

ANNEX 2 Time schedule mission

Date	Place	Activities
16. January 2009	Copenhagen	Preparation
19. January 2009	Denmark – Bolivia	Travelling
20-21 January 2009	La Paz	Meetings
22-23 January 2009	Oruro district	Excursion
24 January – 3 February	La Paz	Meetings
4-5 February 2009	Bolivia – Denmark	Travelling

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ANNEX 4 Meetings held

Date: 20.01.09
Organisation: The Danish Embassy
Venue: The Danish Embassy
Representatives met: Andreas Brogaard Buhl
Also present: Mr. Ronald G.J. Boon
Purpose of meeting: Mission briefing

Date: 20.01.09
Venue: COMIBOL
Organisation: COMIBOL
Representatives:
Participants

Ing. Hugo Miranda Rendon	COMIBOL
Ing. F. Oscar Flores Baltazar	Sergeotecmin
Ing. Eugenio Mendoza Tapia	Ministerio de
Vice Minister	Mineria y Metalurgia
Ing. Juan Coalas Segura	Ministerio de
	Mineria y Metalurgia
Ing. Julio Gatierraz	Ministerio de
	Mineria y Metalurgia
Ing. Andres Cazas	Sergeotecmin
Eddie Baldellon	COMIBOL
Ing. Hernan Uribe	COMIBOL
Ing. Hector Arandia	COMIBOL
	Environmental Unit
Ronald Boon	COMIBOL
	Environmental Unit
Peter W. U. Appel	GEUS

Purpose of meeting: Introduction to the mission

Date: 21.01.09
Venue: Capitol
Representatives/organisation:

Name	Institution
Ing. F. Oscar Flores Baltazar	Sergeotecmin
Ing. Sandro Conde	Sergeotecmin
Ing. Eddie Baldellon	COMIBOL
Ing. Romulo Claura	COMIBOL
Ing. German Nuñes	UMSA Geologia

Ing. Hector Arandia	COMIBOL
Ing. Augustin Perez	U.A.T.F
Ing. Julio Gatierraz	Ministerio de Mineria y Metalurgia
Ing. Juan Carlos Seguratz	Ministerio de
Unidad Geologia	Mineria y Metalurgia
Ing. Alfredo Calizaya	FOMIN
Ing. Luis Télles Toledo	FOMIN
Ronald Boon	COMIBOL Environmental Unit
Peter W. U. Appel	GEUS
Per Kalvig	GEUS

Purpose of meeting: Workshop presentations of all involved organisations

Date: 22.01.09
Venue: Huanuni
Representatives/organisation:
Operation Manager, Mr./ Huanuni Mine
Purpose of meeting: To gain background info from a Sn-mine operated by COMIBOL

Date: 22.01.09
Venue: Kori Kollo Mine
Representatives/organisation: Empressa Minera Inti Raymi S.A.
Purpose of meeting: To gain background info from a privately operated open pit gold mine.

Date: 22.01.09
Venue: Oruro, Baremsa Mine
Representatives/organisation:
Operation Manager: N.N.
Purpose of meeting: To gain background info based on re-cycling tailings project, with the aim to exploit the high Ag-content and to relocate the tailings as part of an environmental mitigation plan.

Date: 23.01.09
Venue: Oruro
Representatives/organisation: 'Cooperativa Minera De 10 Febrero San Jose'
Operation Manager, Mr. NN
Purpose of meeting: To gain background info from one of the Cooperatives

Date: 23.01.09
Venue: Ing. De Minas, University of Oruro
Representatives/organisation:
Ing. José Garcia Castro, Director
Ing Gilberto Villaroel Vega, Docente
Ing Miguel Vargas Mújica, Docente
Purpose of meeting: To explore the possibilities for an ENRECA project

Date: 26.01 2009
Venue: Ministrio De Mineria Y Metalurgia
Representatives/organisation:

Name	Organisation
Ing. Eugenio Mendoza Tapia	Ministerio de
Vice Minister	Mineria y Metalurgia
Ing. Julio Gutierrez	Ministerio de
	Mineria y Metalurgia
Eddie Baldellon,	Ministerio de
Unidad Geologia	Mineria y Metalurgia
Roland Ibanes. Head of	Ministerio de
Metallurgical Unit	Mineria y Metalurgia
Victor Flores. Head of	Ministerio de
Mining Unit	Mineria y Metalurgia
Eliodoro Sandi. Sectorial	Ministerio de
Policy Unit	Mineria y Metalurgia
Peter W. U. Appel	GEUS
Per Kalvig	GEUS

Purpose of meeting: Discussions on (i) Mining policy/the revision of the Mining Code

Date: 26.01.2009
Venue: Ministrio De Mineria Y Metalurgia
Representatives/organisation:

Ing. Julio Gatierraz	Ministerio de
	Mineria y Metalurgia
Rodrigo Ramos C.	MMM
Litzy Castro Velásquez	MMM
Peter W. U. Appel	GEUS
Per Kalvig	GEUS

Purpose of meeting: Discussing ways to promote the mineral potential of Bolivia on the international mining scene.

Date: 26.01.2009
Venue: COMIBOL
Representatives/organisation:
Mr. Eddy. Baldellon; Director of Geology

Mr. Roberto Sossa, Head of Mining Properties
Peter W. U. Appel GEUS
Per Kalvig, GEUS
Purpose of meeting: Discussions with the COMIBOL directorate, to learn about policies and plans for the organisation.

Date: 27.01.2009
Venue: Instituto de investigaciones Geologicas Y Del Medio Ambiente (IGEMA), Universidad Mayor De San Andrés (UMSA),
Representatives/organisation:
Director Jaime Argollo
Mr. German W. Nuñes
Purpose of meeting: Exploring the possibilities for and relevance of an ENRECA project

Date: 27.01.2009
Venue: Ministrio De Mineria Y Metalurgia
Representatives/organisation:

Name	Organisation
Juan Mayto	MMM
Placito Castro	Seneracom
Marcela Fernandex	EMV
Johnny Cano	Sergiotechmin
Alvaro Malky	Sergiotechmin
John Paz Zambrene	COMIBOL
Taboada M. W. Sovi	COMIBOL
Rodrigo Ramos C.	MMM
Litzy Castro Velásquez	MMM
Orlando Escalier	COMIBOL
Peter W. U. Appel	GEUS
Per Kalvig	GEUS

Purpose of meeting: Combined database and GIS facilities developed for the promotion of mineral resources of Yemen. Used as an example for inspiration.

Date: 28.01.2009
Venue: Servicio Nacional de Registro y Control de la Comercialización de Minerales y Metales (SENARECOM)
Representatives/organisation:
Ing. Jorge Fernandez D., Director
E-mail: jfernad@yahoo.com

Web: www.mineria.gov.bo/senarecom
Purpose of meeting: Introduction to the organisation

Date: 28.01.2009
Venue: Fondo Minero De Inversion (FOMIN)
Representatives/organisation:
Lic. Hernan A. C. Jiménez , Director General Ejecutivo (tel: 70134754, e-mail: calizaya_jim@hotmail.com)
Lic. Luis A.T. Toledo, Jefe Unidad Administrativa Financiera (tel: 77232020; e-mail: fomin.bo@gmail.com
Ing. MSc Ernesto C. Amboni (tel: 77275067; e-mail: ercaam@hotmail.com)
Ing. Joaqum Andrade (tel: 73261262); e-mail: fomin@joaqumandrade@hotmail.com)
Purpose of meeting: Info about the FOMIN activities

Date: 28.01.2009
Venue: Sección Diplomática de Noruega
Representatives/organisation:
Ms. Hege Fisknes, Consejera y Jefe de Misión
Tel: 591-2 2118206
E-mail: hege.fisknes@mfa.no
Purpose of meeting: To learn about the situation in the nationalised Bolivian gas sector.

Date: 28.01.2009
Venue: Sergeotecmin
Representatives/organisation:
Ing. Edwin J. Aramayo, Director Técnico de Minas
Tel: 591-2 2318318
E-mail: ejurado03@gmail.com
Web: www.sergeomin.gov.bo
Purpose of meeting: Introduction to the mining cadastre system

Date: 29.01.2009
Venue: Sergeotecmin
Representatives/organisation:
Oscar Flores, Jefe Unidad de Plowficcion; Tel: 73274335;
e-mail: ing.oscar.flores@hotmail.com
Edwin Jurado A., Technical Director Mines and Services; Tel: 2310104;
ejurado03@g-mail.com
Guido Quezada C.,Jefe Regional La Paz, Tel: 2213181;
e-mail: gquezada_cz@hotmail.com
Alvaro Malky I, Enc. Centro Document; Tel. 71524622; e-mail: malky_aluaro@hotmail.com
Johnny Cano, Coordinador Bir. Virtuel; tel: 2121546; johnny_cano@yahoo.es
Purpose of meeting: Briefing

Date: 29.01.2009
Venue: COMIBOL
Representatives/organisation:
Ing. Hugo Miranda Rendon, Presidente Ejecutivo
Mr. Roberto Sossa, Head of Mining Properties
Mr. Eddy Baldelon, Director of Geology
Purpose of meeting: Briefing and discussion

Date: 29.01.2009
Venue: Unidad de Apoyo de Servicios de la Cooperacion Candiense
Representatives/organisation:
Gustravo A. Bracamonto V., Directro
Purpose of meeting: Info about the CIDA plans within the mining sector

Date: 30.01.2009
Venue: Ministrio De Mineria Y Metalurgia
Representatives/organisation:
Mario A. Luna Hereoia; Tecnico Planificacion; E-mail: mariolunaz007@hotmail.com; tel: 73039208
Julio Gutiessez T., Planificacion; E-mail: Julygo007@hotmail.com; tel: 71856111
Purpose of meeting: Discussion of the Mining Code

Date: 30.01.2009
Venue: Ministrio De Mineria Y Metalurgia
Representatives/organisation:
Ministry of Mines:
Mario A. Luna Hereoia; Tecnico Planificacion; E-mail: mariolunaz007@hotmail.com; tel: 73039208
Julio Gutiessez T. , Planificacion; E-mail: Julygo007@hotmail.com; tel: 71856111
LitzyH. Castro Velasuez, Responsable de Sistemas; lcastro@mineria.gov.bo; Tel; 2362810
Rodrigo Ramos Cortez, Profesional Information; rodrigo.ramos@mineria.gov.bo.; Tel 72883102
Sergeotecmin
Alvaro Malky Iborra; Eng. Centro Document; malky.alvaro@hotmail.com; Tel: 71524622
Luis Ariel Infantes; planifieazeon; E-mail: areilinfantes@hotmail.com
Johnny Cano Guarachi; Biblioteca Virtual; cano.Johnny@gmail.com; tel: 2121546
Ronald
Purpose of meeting: Presentation of proposal for technical support to develop a mineral promotion portal.

Date: 02.02.2009
Venue: COMIBOL
Representatives/organisation:
Ing. Hernán Uriby, COMIBOL, representing the President of COMIBOL
Ing. Joilo Moncada Cortez, Dir. Gen. Ejeccutivo, Sergeotecmin
Ing. Luis Ariel Imfantes, Sergeotecmin
Ing. Oscar Florez, B., Sergeotecmin
Mr. A. Brogaard Buhl, Consejero, Emb. Dinamarca
Mr. Ronald G.J. Boon, PRNMA, COMIBOL
Ing. Hector Arandia, COMIBOL
Ing. Eddie Baldellon, Dir. Geologigia, COMIBOL
Ing. Juan Carlos Seguratz, Ministry of Mines and Metallurgy
Purpose of meeting: Presentation of findings, conclusions and recommendations

Date: 03.02.2009
Venue: Danish Embassy
Representatives/organisation:
Winnie Estrup Petersen, Consejera
Andreas Brogaard Buhl, Consejero
Ronald Boon, COMIBOL, PRNMA

Purpose of meeting: Debefriefing

Date: 03.02.2009
Venue: COMIBOL, Dirección De Medio Ambiente
Representatives/organisation:
Lic. Luis Fernando Cáceres Chogue, Monitoreo Ambiental
Ing. Jhonny Ever Victoria Pestanas, Manejo de Geoinformación
Ronald Boon, COMIBOL, PRNMA
Purpose of meeting: Discussions about a potential joint research project on mine drainage water

ANNEX 5 PowerPoint presentations - Workshop

Geological Survey of Denmark and Greenland

GEUS

Raw materials

Energy

Water

Nature & Environment

Databanks

Mineral resources

GEUS

Mineral resources as an important industry in Greenland

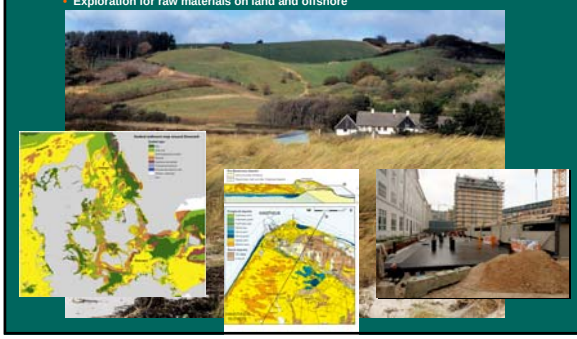
- Geological, -geophysical and -geochemical mapping
- Data interpretation and resource evaluations

Raw materials

GEUS

Balance between raw material extraction and nature

- Geological mapping in Denmark
- Exploration for raw materials on land and offshore



Energy resources

GEUS

Improved oil exploitation and new discoveries in Denmark
Mapping hydrocarbon resources in Greenland
Renewable energy and CO2 reduction

Energy resources

GEUS

Delineation of continental shelf areas

- United Nations Convention on the Law of the Sea - UNCLOS
- Document possible claims for extended continental shelfareas
- Seismic, gravimetric and depth surveys
- 2 areas around Faeroe Islands and 3 around Greenland

Water resources

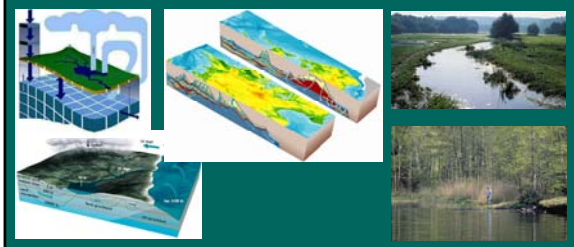
GEUS

Plenty of water for man and nature

Groundwater protection

Effect of climate change on water cycle

Research for a common European standard



Nature and climate

GEUS

Climate and environmental challenges

- Marine geology to solve the climate puzzle
- Monitoring the Greenland ice sheet

Nature and climate

GEUS

Fighting soil pollution

Earthquake research and monitoring

Coastal zone management

Databanks and information

GEUS

Easy access to geological data

- National geological and hydrogeological well database
- National geophysical database for environment and raw materials
- National database for oil and gas deep wells
- Core store

Building a world with expertise

GEUS

Welfare and balance

- Building oil expertise in Vietnam
- Geological- and geophysical capacity building in Ghana
- Environmental expertise to Tanzania, Kenya
- Water expertise to Ghana, Vietnam, Ukraine, Latvia, Bolivia
- Mining expertise to Romania, Mongolia, Tanzania, Kyrgyzstan, Laos, Yemen, Indonesia

Strategy Statements for Promotion of Bolivia's Mineral Resources

Peter W. U. Appel
Geological Survey of Denmark and Greenland
Oester Voldgade 10
Copenhagen, Denmark
pa@geus.dk

GEUS

Top five to attract exploration

- Attractive geology
- Competitive policies
- Transparent mining law
- Easy access to data
- Promotion

GEUS

Main focus

COMIBOL should focus on the geological basis for the development of a mining industry in Bolivia, organising existing information from previous and ongoing investigations and exploration activities and producing new information and data through its own scientific activities.

GEUS

Qualified interface to knowledge

- COMIBOL should make relevant geological information and data in its archives available for the international exploration and mining industry.
- The access to the geological knowledge should be organised through qualified personalised assistance, archives and databases, and modern web-based facilities.

GEUS

Improved digital knowledge base

COMIBOL should undertake the digitization of geoscience information and data in order to improve their use.

Modern facilities should be utilised to display the geological potential of Bolivia internationally.

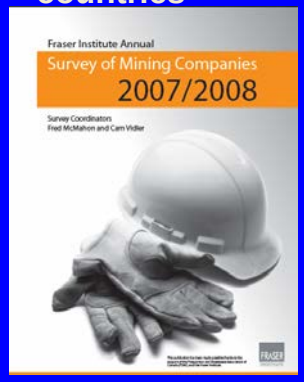
International outlook

COMIBOL should participate in selected international events, exhibitions, and conferences to draw attention to Bolivia's geological potential and thereby encourage international investments in Bolivia's future mining sector.

This requires that

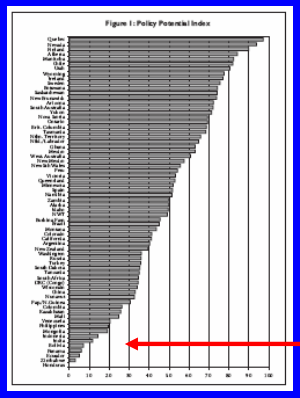
- Comibol and the society accept this
- Facilities and procedures exist within COMIBOL
- COMIBOL staff are aware of their roles
- Promotional consequences of scientific progress is recognised and acted upon by COMIBOL
- Legal and judiciary foundation for COMIBOL is in place
- COMIBOL must build its international presence

Mining companies about different countries



- **Sent to 3000 companies around the world**
- **Survey represents responses from 372 of those**
- **They represent exploration spending of 1.48 billion US$ in 2007 and 0.98 billion US$ in 2006**
- **That corresponds to 14.8% of total global exploration in 2007; 13.7% for 2006**
- **Bolivia is at the bottom the list of about 70 countries.**

Policy Potential Index



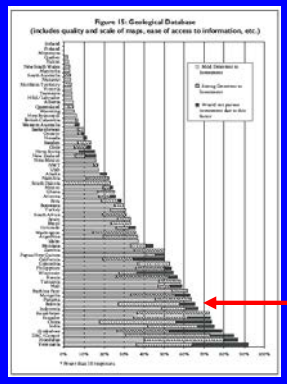
Quebec Nevada

"A report card to governments on the attractiveness of their mining policies"

Bolivia
Zimbabwe Honduras

GEUS

Geological Database (includes quality, scale, ease of access to information)



Ireland, Finland, Minnesota, Qebec

Bolivia

Venezuela, Honduras, DR Congo

GEUS

A lesson learned from this?

- If the Government of Bolivia can level the playing field by creating the right mining law, taxation law, political stability, transparency, etc. in accordance with best practices
- Then COMIBOL and its staff can convince the international mining industry about the economic geological potential of Yemen by giving access to the geological database

GEUS

Promotion of Mineral potential

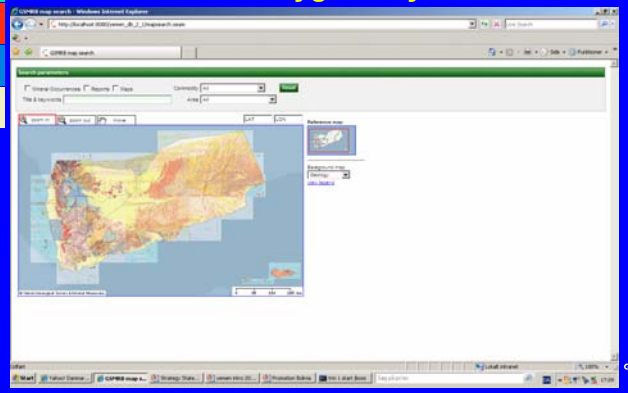
- Development of suitable database structure to store metadata on various geo-data to support the web-site
- Improvement of the web-site
- Implementation of web-site, database and software; set-up and training
- International promotional activities e.g. at the PDAC in Toronto

GEUS

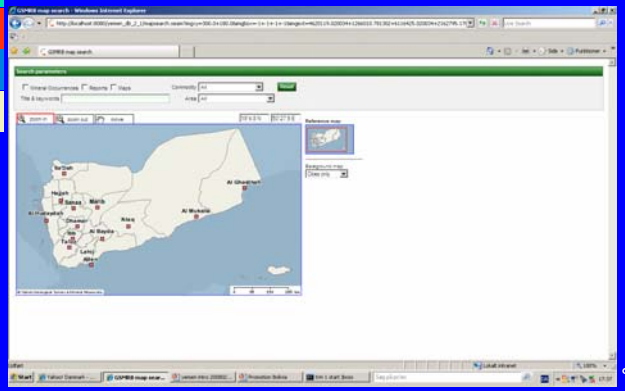
Introduction of Yemen on the international mining scene

- Establishing a database
- WEB page linked to the database
- PDAC
- Fact sheets
- Extended handouts
- Posters

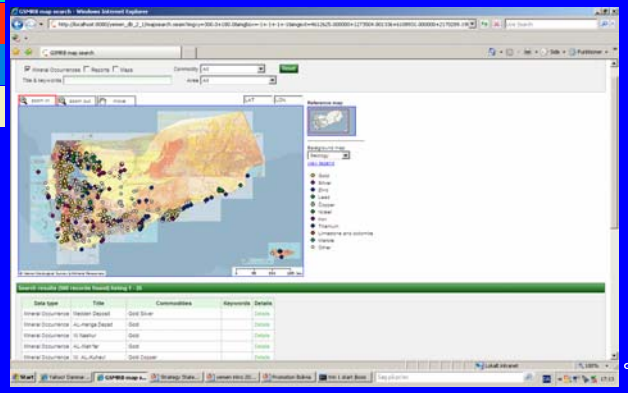
Yemen Survey website www.ygsmrb.ye



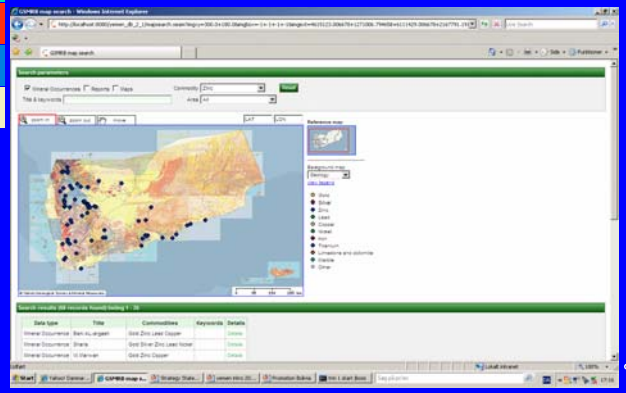
Cities and governorates

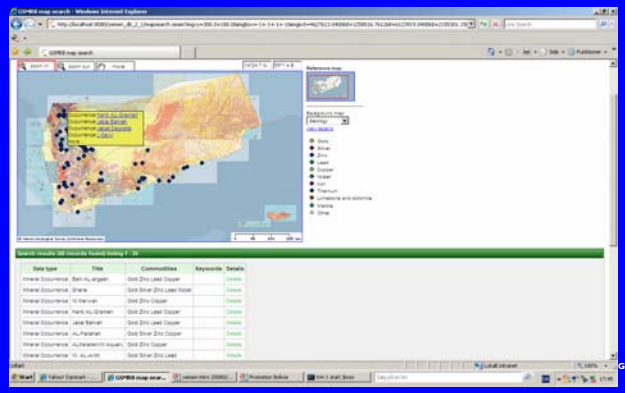


All mineral occurrences

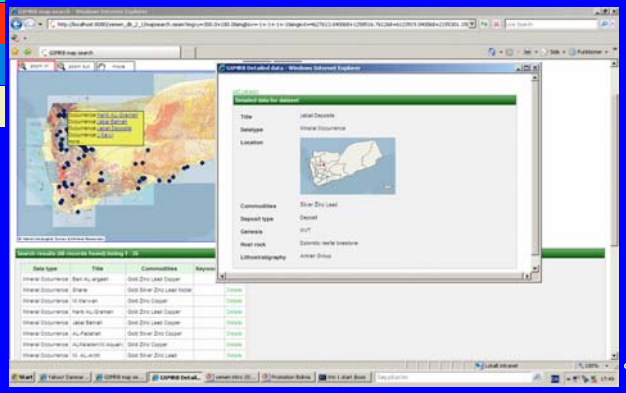


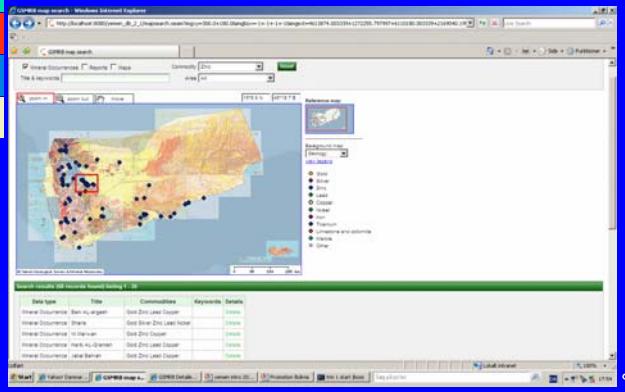
Zinc showings

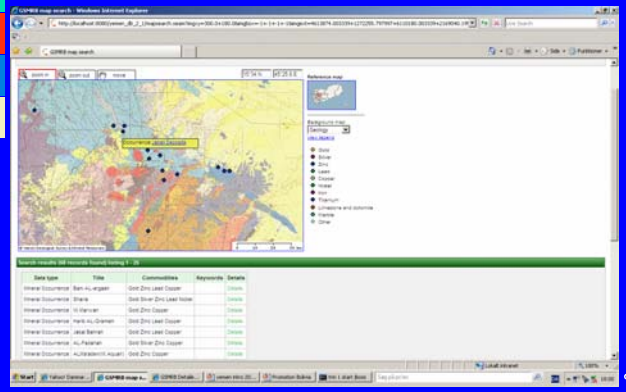




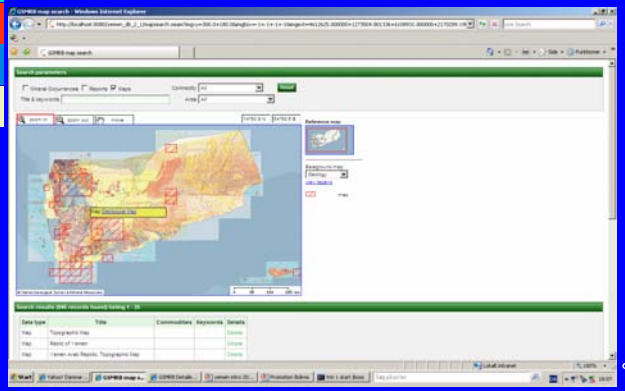
Jabal Salab zinc mine

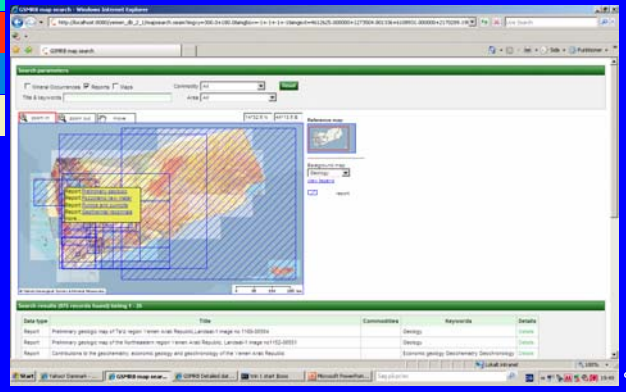






Topo- and geological maps





Extended handout

GEUS

Factsheets

GEUS

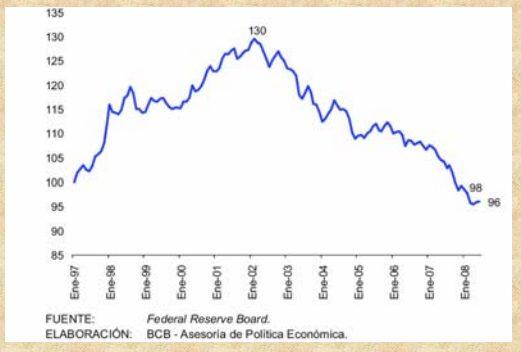
PDAC

GEUS

La crisis mundial

- *Se estima que el PIB norteamericano caerá en -0,2% el 2008, y decrecerá en -2% el 2009*
- *La economía alemana se encuentra en recesión y se estima que el PIB chino se reducirá a 7%*
- *Se estima que el valor de los derivados financieros mundiales asciende a 585 billones de dólares, mientras que el producto llega a 50 billones. El programa del FMI prevé un impulso fiscal de 1,2 billones*
- *Es posible que el precio del petróleo descienda a $us 30 el barril*

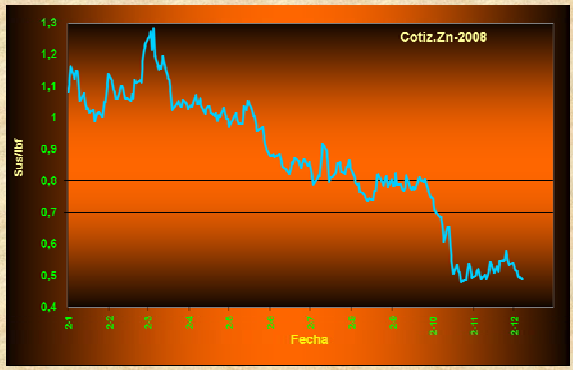
Índice del tipo de cambio nominal multilateral del dólar (Base 1997 = 100)



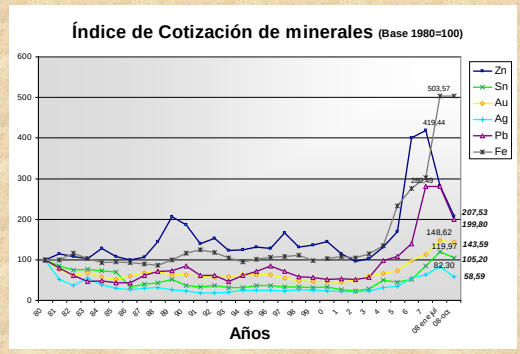
FUENTE: *Federal Reserve Board.*
ELABORACIÓN: BCB - Asesoría de Política Económica.

Cotización del Estaño

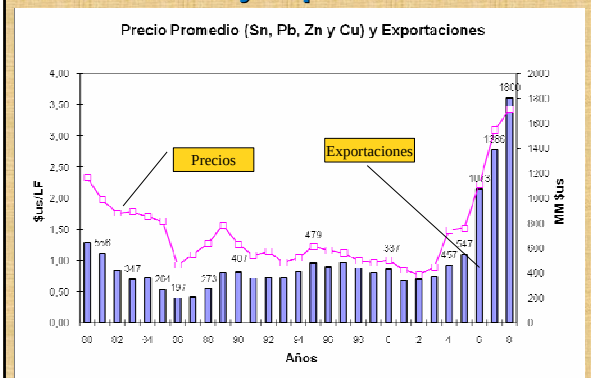
Cotización del Zinc



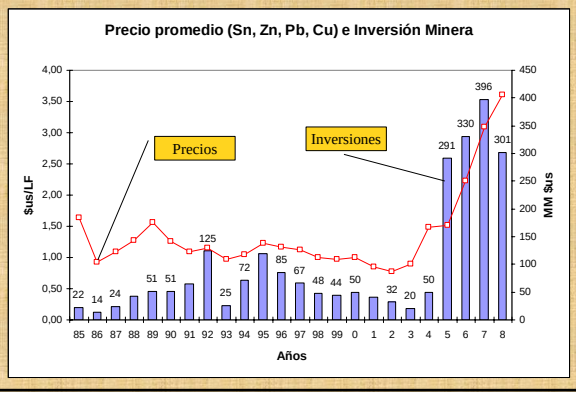
Índice de Cotización de Minerales



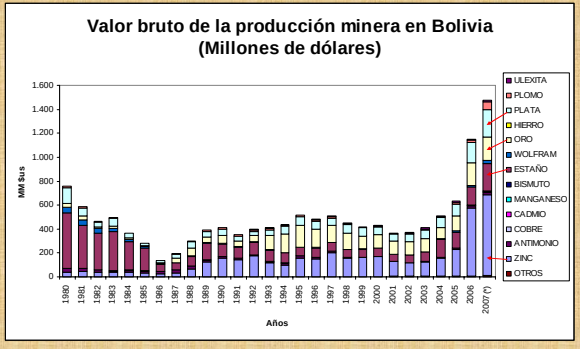
Precios y Exportaciones



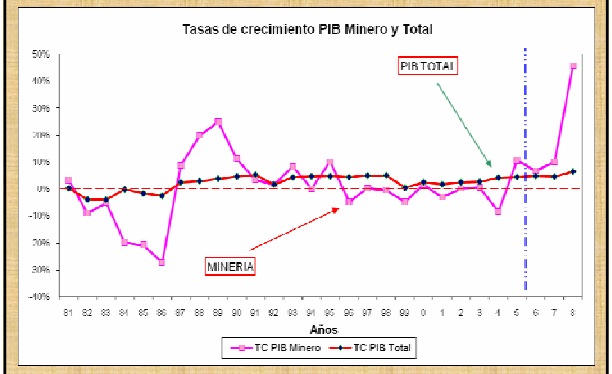
Precios e Inversión



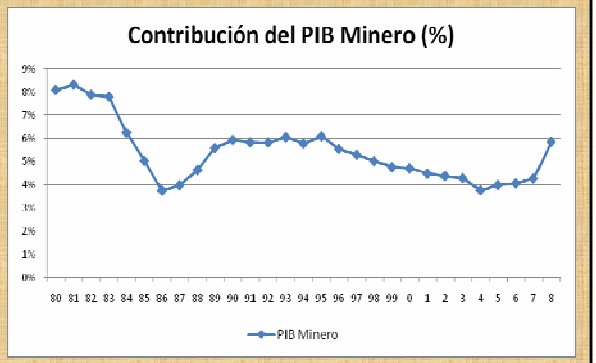
Estructura de la producción



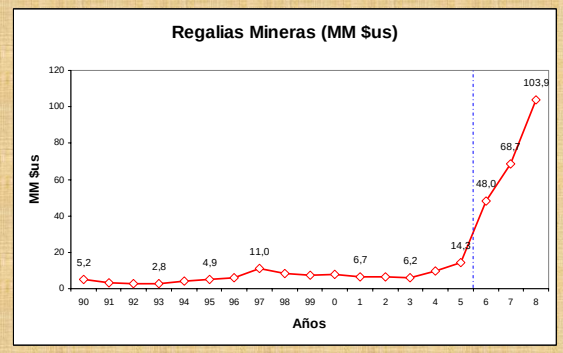
Tasa de Crecimiento PIB Minero



Contribución al PIB



Regalías Mineras

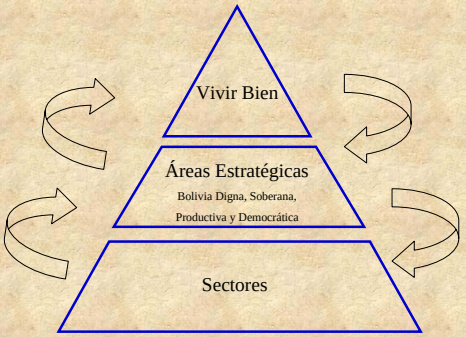


Potencial minero

Resultados del diagnóstico sectorial

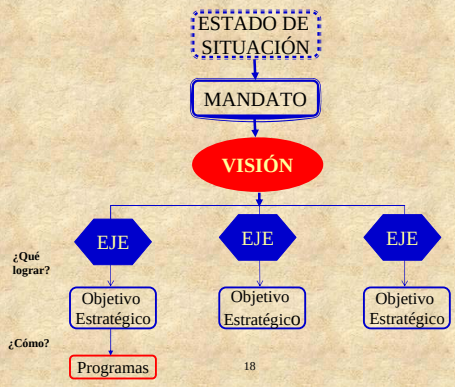
- *Existe una crisis mundial que tiende a profundizarse*
- *Impacta en Bolivia por la poca diversificación de la producción y escaso desarrollo tecnológico*
- *Genera procesos de desempleo, empobrecimiento y migración*
- *Al no invertirse en prospección y exploración se repite el ciclo regresivo*
- *En un entorno de pobreza es difícil pensar en el medio ambiente*

Esquema y articulación PND



17

Estructura del PSD



18

Mandato Político y Social del Sector

Lograr la transformación de una explotación primario exportadora a una industria competitiva, rentable con alta productividad que privilegie la generación de valor agregado mediante el fortalecimiento de la cadena productiva minero metalúrgica para responder a las coyunturas cíclicas de precios, con el fin de producir excedentes que contribuyan al vivir bien

Aspecto que debe ser desarrollado:

Explorando el territorio nacional para hallar nuevos recursos mineralógicos, generando reservas, diversificando y desarrollando nuevos productos, estableciendo un marco jurídico con reglas claras que brinden seguridad jurídica al Estado y al sector privado que tenga la capacidad de promover inversiones de largo aliento.

Logrando que el Estado participe en toda la cadena productiva, desarrollando y fortaleciendo la minería mediana, chica y cooperativizada y preservando el medio ambiente, generando mecanismos que promuevan la consulta pública con las comunidades que a su vez brinden las condiciones para el desarrollo integral en áreas mineras empobrecidas mediante el incremento de las fuentes de empleo.

Cuestiones que en conjunto permitirán beneficiar a la población boliviana

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Visión del sector

En el año 2015, gracias al aporte del sector minero:

Bolivia cuenta con una matriz productiva minera diversificada y fortalecida que es capaz de ofrecer empleos estables y generar las condiciones para que una menor cantidad de población se encuentre en situación de pobreza, sin afectar al medio ambiente y toma en cuenta los usos, costumbres y voluntad de las comunidades aledañas garantizando una explotación e industrialización de recursos mineralógicos sostenible en el tiempo.

Para ello cuenta con emprendimientos mineros de alta productividad que funcionan aún en condiciones de bajos precios, vinculados a empresas estatales, privadas, mixtas, cooperativas y comunitarias eficientes. Asimismo, estas se desarrollan en un entorno que se ha generado a partir de una exploración extensiva que abarca gran parte del territorio nacional lo que ha conllevado el incremento de las reservas fiscales.

Así la minería se ha convertido en un sector estratégico impulsor del desarrollo generador de excedentes económicos que se asienta en una COMIBOL fuerte y en una Minería Chica y Cooperativizada estable que fomenta la participación de la comunidad y las organizaciones sociales con un empleo digno para vivir bien.

20

Ejes de Desarrollo

- El país cuenta con una matriz productiva minera diversificada y fortalecida que es capaz de ofrecer empleos estables y generar las condiciones para que una menor cantidad de gente se encuentre en situación de pobreza, sin afectar al medio ambiente y tomando en cuenta los usos, costumbres y voluntad de las comunidades aledañas garantizando una explotación e industrialización de recursos mineralógicos sostenible en el tiempo.
- Para ello cuenta con emprendimientos mineros de alta productividad que funcionan aún en condiciones de bajos precios, vinculados a empresas estatales, privadas, mixtas, cooperativas y comunitarias eficientes. Asimismo, estas se desarrollan en un entorno que se ha generado a partir de una exploración extensiva que abarca gran parte del territorio nacional lo que ha conllevado el incremento de las reservas fiscales.
- Así la minería se ha convertido en un sector estratégico impulsor del desarrollo generador de excedentes económicos que se asienta en una COMIBOL fuerte y en una Minería Chica y Cooperativizada estable que fomenta la participación de la comunidad y las organizaciones sociales con un empleo digno para vivir bien.

Diversificar la matriz productiva e industrializar los recursos mineralógicos

Preservación, remediación y mitigación ambiental

Participación de la comunidad

Desarrollo sostenible en áreas mineras

Estado protagonista y promotor

Prospección y exploración

Fortalecimiento de la minería chica y cooperativizada

Ejes de Desarrollo

Eje de Desarrollo 1

Diversificar la matriz productiva e industrializar los recursos mineralógicos

Objetivo Estratégico: Diversificar la producción minera hacia otros recursos metálicos y no metálicos como ser piedras preciosas, semipreciosas, áridos, rocas de cantera, evaporíticos y radioactivos

Indicador: Valor bruto de la producción de la minería no tradicional (MM $us)

Línea base: 0 MM $us al 2008

Meta: 1.500 MM $us acumulados hasta el 2015

Objetivo Estratégico: Generar valor agregado en la cadena productiva minero metalúrgica

Indicador: PIB de procesos de industrialización minera (MM $us)

Línea base: 147 MM $us al 2007

Meta: 2.000 MM $us acumulados hasta el 2015

Eje de Desarrollo 2

Prospección y exploración

Objetivo Estratégico: Determinar el potencial mineralógico del territorio boliviano

Indicador: Área prospectada (%)

Línea base: 15% al 2007

Meta: 45% acumulados hasta el 2015

Objetivo Estratégico: Identificar nuevos yacimientos y reservas mineralógicas para la implementación de proyectos en el sector minero

Indicador: Cantidad de Reservas (TMF)

Línea base: 6.122.842 TMF al 2000

Meta: 14.455.318 TMF acumuladas hasta el 2015

Eje de Desarrollo 3

Estado protagonista y promotor de inversiones minero metalúrgicas

Objetivo Estratégico: Fortalecer las entidades estatales para que participen en toda la cadena productiva con énfasis en actividades de valor agregado generando condiciones para fomentar emprendimientos mixtos o privados

Indicador: Inversión en Minería (MM $us) / Relación entre producción estatal y total (%)

Línea base: 366 MM $us al 2008
8% de la producción

Meta: 3.000 MM $us acumulados hasta el 2015
35% de la producción en manos del Estado

Eje de Desarrollo 4

Preservación, remediación y mitigación ambiental

Objetivo Estratégico: Disminuir los impactos negativos generados por pasivos mineros y garantizar que los proyectos cumplan con normas de gestión ambiental para evitar el efecto de la contaminación sobre la población y su entorno natural

Indicador: Grado de concentración de minerales en cuencas (mg/litro) / Proyectos minero metalúrgicos con gestión ambiental (No Proyectos)

Línea base: 0,74 mg/l de Pb en el Lago Poopo
25% de proyectos con gestión ambiental

Meta: 0,20 mg/l de Pb en el Lago Poopo
99% de proyectos con gestión ambiental

Eje de Desarrollo 5

Fortalecimiento de la minería chica y cooperativizada

Objetivo Estratégico: Generar condiciones estables que permitan un crecimiento sostenido de la producción y el mejoramiento de las condiciones de trabajo de la minería chica y cooperativizada

Indicador: Tasa de crecimiento de la producción minera chica y cooperativizada (%)

Línea base: -10% : 80s; 0% : 90s ; 30% : 2000

Meta: Al menos 5% anual

Eje de Desarrollo 6

Desarrollo integral y participación de la comunidad en áreas mineras

Objetivo Estratégico: Generar oportunidades de desarrollo económico, social y cultural en la población de áreas circundantes a emprendimientos mineros en el marco del respeto de sus modos de vida

Indicador: Índice de desarrollo humano

Línea base: 0,497

Meta: 0,692

Eje de Desarrollo 1

Diversificar la matriz productiva e industrializar los recursos mineralógicos

Objetivo Estratégico: Diversificar la producción minera hacia otros recursos metálicos y no metálicos como ser piedras preciosas, semipreciosas, áridos, rocas de cantera, evaporíticos y radioactivos

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Eje de Desarrollo 1

Diversificar la matriz productiva e industrializar los recursos mineralógicos

Objetivo Estratégico: Generar valor agregado en la cadena productiva minero metalúrgica

31

Eje de Desarrollo 2

Prospección y exploración

Objetivo Estratégico: Determinar el potencial mineralógico del territorio boliviano

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Eje de Desarrollo 2

Objetivo Estratégico: Identificar nuevos yacimientos y reservas mineralógicas para la implementación de proyectos en el sector minero

Prospección y exploración

Eje de Desarrollo 3

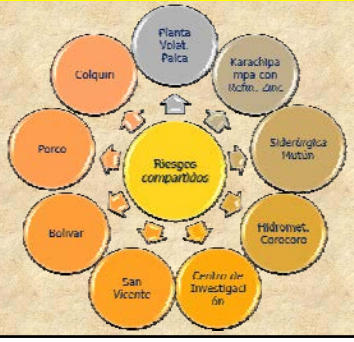
Objetivo Estratégico: Fortalecer las entidades estatales para que participen en toda la cadena productiva con énfasis en actividades de valor agregado generando condiciones para fomentar emprendimientos mixtos o privados

Estado protagonista y promotor de inversiones minero metalúrgicas

Eje de Desarrollo 3

Objetivo Estratégico: Fortalecer las entidades estatales para que participen en toda la cadena productiva con énfasis en actividades de valor agregado generando condiciones para fomentar emprendimientos mixtos o privados

Estado protagonista y promotor de inversiones minero metalúrgicas



Eje de Desarrollo 3

Objetivo Estratégico: Fortalecer las entidades estatales para que participen en toda la cadena productiva con énfasis en actividades de valor agregado generando condiciones para fomentar emprendimientos mixtos o privados

Estado protagonista y promotor de inversiones minero metalúrgicas

Eje de Desarrollo 4

Preservación, remediación y mitigación ambiental

Objetivo Estratégico: Disminuir los impactos negativos generados por pasivos mineros y garantizar que los proyectos cumplan con normas de gestión ambiental para evitar el efecto de la contaminación sobre la población y su entorno natural

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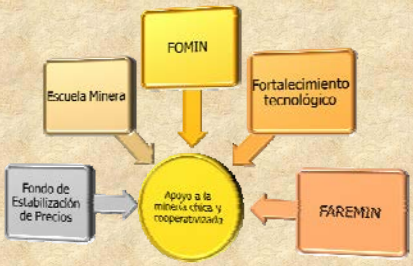
Eje de Desarrollo 5

Fortalecimiento de la minería chica y cooperativizada

Objetivo Estratégico: Generar condiciones estables que permitan un crecimiento sostenido de la producción y el mejoramiento de las condiciones de trabajo de la minería chica y cooperativizada



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Eje de Desarrollo 6

Desarrollo integral y participación de la comunidad en áreas mineras

Objetivo Estratégico: Generar oportunidades de desarrollo económico, social y cultural en la población de áreas circundantes a emprendimientos mineros en el marco del respeto de sus modos de vida

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Programas en Inversión del Plan Sectorial

- *Todo lo señalado se traduce en 10 programas y 71 proyectos con la siguiente estructura de inversiones:*

	2008	2009	2010	2011	2012	2013	2014	2015	TOTAL	%
Coop. Intern. & Estado	7,97	21,61	11,15	11,84	11,38	11,15	24,89	1,66	**101,64**	2,8%
Estatal	50,38	119,99	97,91	174,95	141,66	81,80	0,50	0,50	**667,70**	18,7%
Privado	152,10	26,40	6,00	6,00	6,00	4,00	0,00	0,00	**200,50**	5,6%
Riesgo Compartido	79,55	511,09	380,20	437,00	299,00	350,00	350,00	200,00	**2.606,84**	72,9%
TOTAL	**289,99**	**679,09**	**495,26**	**629,79**	**458,04**	**446,95**	**375,39**	**202,16**	**3.576,68**	100%
%	8,1%	19,0%	13,8%	17,6%	12,8%	12,5%	10,5%	5,7%	100,0%	


Muchas gracias…

CORPORACIÓN
MINERA DE BOLIVIA

PARTICIPACION DE LA CORPORACION MINERA DE BOLIVÍA EN LA CADENA PRODUCTIVÁ DEL PAIS

- **INTRODUCCION**

- **Hasta la promulgación de de la ley No.3720, COMIBOL ha sido una institución encargada de administrar el patrimonio minero-metalúrgico donde no obstante los actuales altos precios de los metales, la mayoría de los recursos minerales han sido casi agotados y varias de sus plantas metalúrgicas han sido desmanteladas y contemplan procesos tecnológicos obsoletos y no actualizados.**

- **con la aplicación y ejecución de la ley No.3720 promulgada el 31 de julio del presente año, con la cual se abre para COMIBOL una nueva era de grandes desafíos y oportunidades que estamos seguros significara dar fuentes de trabajo y bienestar para todos los bolivianos.**

NUEVO ROL DE COMIBOL.

- **A partir del 2007 en función a la nueva política minero metalúrgica COMIBOL tendrá nuevas oportunidades generadas en tareas de exploración, prospección, extracción, beneficio y procesamiento de minerales e industrialización en función al nuevo código de minería. Con la elaboración del nuevo Código de Minería y su aplicación, el Estado deberá devolver a COMIBOL su condición de "brazo operativo" y ejecutor en todas las actividades minero-metalúrgicas del país.**

- **En el marco de la aplicación de la nueva ley, COMIBOL debe transformarse de una simple administradora a una empresa operativa y productiva, empleando para el efecto los recursos mineralógicos y la infraestructura de la que dispone así como recurriendo a los escasos recursos humanos constituidos por profesionales y trabajadores.**

- **Generar recursos económicos a nivel central y regional en el ámbito publico y privado para mejorar el nivel de vida de la población en general y minera en particular, generando empleos directos e indirectos.**
- **Aplicar en todo el ciclo productivo de las operaciones mineras nuevas tecnologías acorde a la nueva minería moderna.**

4. BASES Y LINEAMIENTOS GENERALES PARA LA PARTICIPACION DE COMIBOL EN LA CADENA PRODUCTIVA

- Explotación y tratamiento metalúrgico de yacimientos primarios (Huanuni, Caracoles y otros yacimientos).
- Explotación y tratamiento metalúrgico de yacimientos que no estén comprometidos en contratos.
- Explotación y tratamiento metalúrgico de desmontes, colas, relaves, morrenas y otros.
- Industrialización en base a la cadena productiva hasta obtener metales con mayor valor agregado.
- Comercialización directa de concentrados y metálicos por parte de COMIBOL, sin intermediarios.

4.1. YACIMIENTOS PRIMARIOS Y RECURSOS EN SUPERFICIE PARA EXPLOTACION A CORTO Y MEDIANO PLAZO

4.1.1. Yacimientos primarios COMIBOL, realiza trabajos de exploración y explotación en los siguientes yacimientos

	Yacimiento	Localización	Minerales
1	E.M.Huanuni explotación actual y fase de exploración de los complejos en María Francisca,Pepitos, Omicron y Paco.	Oruro-Prov.Dalence	Sn,Zn,Pb,Ag. En fase de exploración y determinación de reservas.
2	Miguel-Cuatro Amigos Fase exploración del Yacimiento	La Paz-Matilde	Pb-Ag. Zn- Ag.
3	Inés. exploración del yacimiento polimetalico	La Paz-Caracoles	WO_3-Zn, Pb-Ag, Sb
4	Bengala. exploración del yacimiento	La Paz-Caracoles	Sn
5	Colavi. exploración del yacimiento	Potosí	Sn
6	San Antonio de Lipez exploración del yacimiento	Potosí-Sud Lipez	Pb –Ag. -Zn-Ag
7	Corocoro exploración y explotación a plazo inmediato y mediato.	La Paz	Cu

4.1.2. Colas y Desmontes para su explotación directa por COMIBOL: Constituyen recursos mineralógicos que COMIBOL puede encarar en forma directa, entre éstos se hallan las colas San Miguel que tiene un proyecto elaborado, colas ingenio Caracoles y las colas antiguas Telamayu. Las características son las siguientes:

	Yacimiento	Localización	Minerales	Reservas (t)	Inversión ($us)
1	San Miguel. Planta proyectada 2000 t/d.. vida util 6 años	Potosí	Ag-Sn	3.700.000 t. con 0.79 % Sn, 100 g/t Ag, 0.31 % Cu.	29.664.903
2	Ingenio Molinos-Caracoles	La Paz-Caracoles	Sn	1.600.000 t. con 0.38 % Sn	810.752
3	Colas Antiguas Telamayu	Potosí-Telamayu	Sn-Ag	447.000 t con 1.0 % Sn, 196 g/t Ag.	3.000.000

4.1.3 Colas y desmontes en Contratos de RC (COMIBOL-Inversionistas): Constituyen colas y descartes de gran envergadura, que pueden ser encaradas con empresas mineras y con aplicación de tecnología reciente y gran capacidad.

No.	Yacimiento	Localización	Minerales	Reservas(t)
1	Colas arenas Catavi	Potosí-Catavi	Sn	19.000.000 t. con 0.35 % Sn
2	Descartes Sink and Float Siglo XX.	Potosi-Siglo XX	Sn	22.000.000 t con 0.32 % Sn

5. PROYECTOS PRIORITARIOS DE INVERSION

5.1. PROYECTO DE TRATAMIENTO METALURGICO Y REMEDIACION AMBIENTAL. COLAS ANTIGUAS SAN MIGUEL

- Reservas: 3,738,405 toneladas, 079 % Sn , 100 g/t Ag y 0.31 % Sn
- Capacidad proyectada: 2000 t/d
- Inversión: $us. 29,664,903
- Proceso: Lixiviación acida, básica y gravimetría por Sn.
- Costo de tratamiento: 15.44 $us./t
- Utilidad anual : $us. 8.385.471
- Vida útil: 6 años

5.2. PROYECTO HIDROMETALURGICO E.M.COROCORO PRIMERA FASE:

- Reservas: 10,000,000 t de óxidos y afloramientos en superficie.
- Capacidad proyectada: 600 t/d
- Inversión: $us. 8,822,842
- Proceso: lixiviación por agitación, extracción por solventes y electrodeposición.
- Costos operativos: $us. 3,921,174
- Utilidad neta anual: $us. 6,717,981
- Producción anual: 2,397 ton cobre metálico con ley 99.996 % Cu.
- T.I.R. 51.94 %

SEGUNDA FASE:

Estudio de Factibilidad para explotación masiva, lixiviación y obtención de cobre electrolítico. Se Proyecta la instalación de una Planta Hidrometalúrgica con capacidad de 2000 t/d con una inversión estimada de 100 millones de dólares.

5.3. TRATAMIENTO METALURGICO COLAS ANTIGUAS CARACOLES

•Reservas:	1,591,458 t con 0.38 % Sn.
•Capacidad Proyectada:	600 t/d
•Inversión:	$us. 2,429,147
•Proceso:	Uso de espirales, molinos, jigs centrifugos y mesas concentradoras (tecnología moderna).
•Ingresos anual:	$us. 827,594
•Utilidad al final del proyecto:	$us. 6,620,750
•Vida del Proyecto:	8 años.

6. PROYECTO MEDIO AMBIENTE CON PARTICIPACION DE DANIDA (DINAMARCA) Y COMIBOL.

COMIBOL suscribió contratos con el gobierno de Dinamarca para la mitigación de pasivos ambientales de COMIBOL a través DANIDA. Con un aporte económico en el quiquenio 2002 - 2010 de:

DANIDA	**$us**	**5. 500.000**
COMIBOL	**$us**	**2. 541.000**
TOTAL	**$us**	**8.041.000**

En la Primera Fase se ejecutaron (2001-2005): Mitigación y Control Ambiental dique de colas en:

- Santa Ana
- Telamayu
- Tatasi

Con una inversión de: $us **4.012.942.**

En la segunda fase se proyecta ejecutar:

En Dólares

1	Mitigación y control ambiental Dique de Colas Tasna	Potosí-Quechisla	1.022.186	COMIBOL – DANIDA (En licitación)
2	Aguas Acidas San Jose	Oruro	1.000.000	DANIDA (Proyecto)
3	Control y Mitigación de la contaminación en la microcuenca de Colquechaca	Norte Potosí	448.208	COMIBOL - DANIDA (Proyecto)
4	Proyecto Integral de control y Mitigación Matilde	Norte La Paz	309.724	COMIBOL - DANIDA (Proyecto)
5	Control y mitigación ambiental de desechos peligrosos - La Palca	Potosí	241.200	COMIBOL - DANIDA (Proyecto)
6	Control y mitigación ambiental Centro Minero Catavi	Norte Potosí	617.000	COMIBOL - DANIDA (Proyecto)
7	Control y mitigación ambiental Cerro Rico Pallaviri	Potosí	389.740	COMIBOL - DANIDA (Proyecto)

El convenio con DANIDA (Gobierno de Dinamarca), se ejecutó la 1ra fase desde la gestión 2001 hasta el 2005 con la finalidad de mitigar los impactos ambientales en las microcuencas de los ríos Tupiza y Cotagaita. La Segunda fase comprendida entre las gestiones 2006 al 2010, se ejecutará proyectos de prevención, control y mitigación ambiental de acuerdo a un sistema de priorización en los centros mineros de propiedad de COMIBOL.

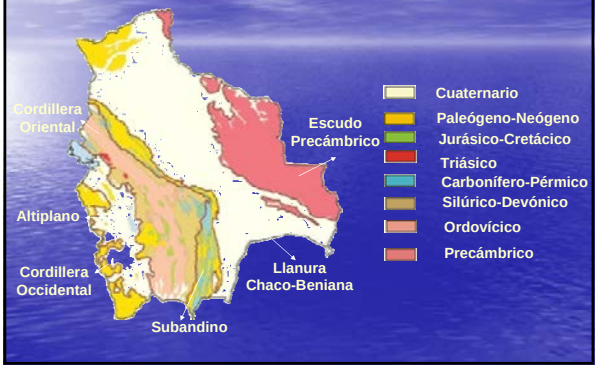
SERGEOTECMIN

BOLIVIA Y SU POTENCIAL GEOLÓGICO MINERO

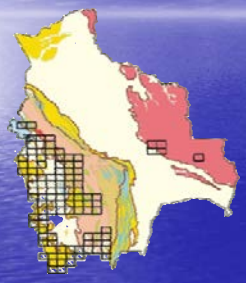
Elaborar, publicar y difundir mapas y documentos de geología básica, recursos minerales, geoambientales y de peligros geológicos, con información relevante para empresas que desarrollan actividades de exploración y explotación minera, potenciales inversionistas, y para identificar aquellas situaciones que puedan afectar la vida del ser humano y su entorno.

Entregar Asistencia Técnica en materias de constitución de las concesiones mineras y en materias geológicas, con el objeto de dar cumplimiento a la normativa vigente, en relación a la constitución de la propiedad minera de exploración y de explotación.

MAPA GEOLÓGICO SIMPLIFICADO DE BOLIVIA



MAPAS GEOLÓGICOS
Escala 1:100.000

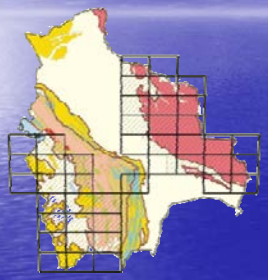


153 cartas geológicas

98 publicadas
55 inéditas

Representan el 25% de la cobertura total del territorio boliviano

MAPAS TEMATICOS
Escala 1:250.000

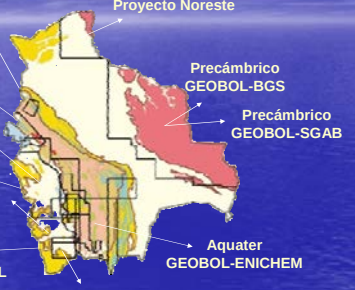


37 cartas temáticas

21 Cordillera Oriental, Occidental y Altiplano
17 Escudo Precámbrico

Representan el 44% de la cobertura total del territorio boliviano

PROYECTOS DE EJECUTADOS GEOBOL-SERGEOMIN-SERGEOTECMIN



Cordillera
GEOBOL-PNUD

Proyecto Noreste

Yani-Pelechuco
SERGEOMIN-JICA

Precámbrico
GEOBOL-BGS

Oruro-Uyuni
SERGEOMIN-JICA

Precámbrico
GEOBOL-SGAB

Potosí
GEOBOL-BGR

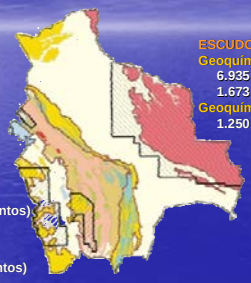
Cordillera Occidental
GEOBOL-TDP-USGS

Aquater
GEOBOL-ENICHEM

Lípez
GEOBOL-COMIBOL

GEOBOL-SGAB-BANCO MUNDIAL
San Pablo de Lípez GEOBOL-RSI

PROSPECCION GEOQUIMICA

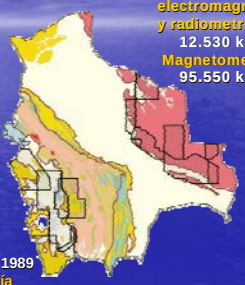


ESCUDO PRECAMBRICO
Geoquímica de sedimentos
6.935 muestras (22 elementos)
1.673 muestras (16 elementos)
Geoquímica de suelos
1.250 muestras (22 elementos)

OROGENO ANDINO
Geoquímica de sedimentos
2.954 muestras (Au+48)
2.040 muestras (7 elementos)
Geoquímica de suelos
832 muestras (Au+48)
4.500 muestras (7 elementos)
Geoquímica de rocas
4.240 muestras (Au+48)

Fuente: Proyectos GEOBOL - BGR, JICA, PMA, BGS, SGAB

GEOFISICA AEROTRANSPORTADA



ESCUDO PRECAMBRICO
Magnetometría, electromagnetismo y radiometría
12.530 km²/BGM 1991
Magnetometría y radiometría
95.550 km²/Sander 1996

OROGENO ANDINO
Magnetometría, electromagnetismo y radiometría
27.000 km²/SGAB 1963
Magnetometría
33.130 km²/BGM 1991
60.000 km²/AeroService 1989
Magnetometría y radiometría
32.900 km²/SIAL 2001

Fuente: Proyectos GEOBOL - PMA, SGAB, YPFB

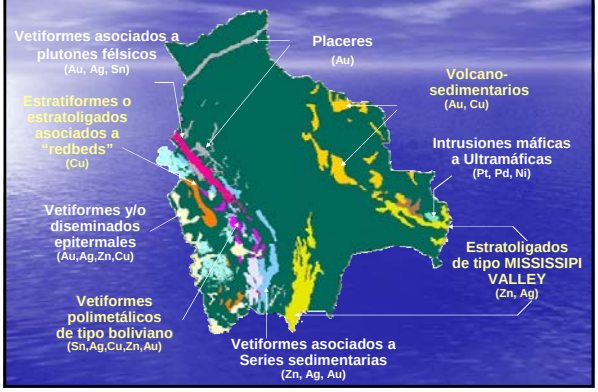
PROVINCIAS METALOGÉNICAS DE BOLIVIA

OROGENO ANDINO: 42% territorio boliviano, con 2.200 prospectos y minas (Ag, Sn, W, Sb, Pb, Zn, Cu, Bi, Au, etc.)
PRECAMBRICO: 18% territorio boliviano, con 100 prospectos (Au, Pt, Ni, Fe, etc.)
LLANURA CHACO-BENIANA: 40% territorio boliviano (Au, Sn, W, etc.)

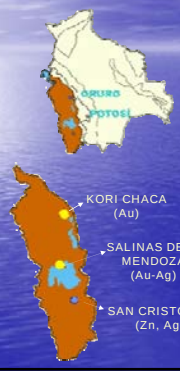
PRINCIPALES DEPÓSITOS MINERALES

YACIMIENTOS DESARROLLADOS EN LOS ÚLTIMOS 15 AÑOS:
Kori Kollo (Au-Ag), San Cristóbal (Zn-Ag), Don Mario (Au-Ag-Cu), Kori Chaca (Au), Puquio N. (Au), San Bartolomé (Ag-Sn), San Bernardino (Au), San Simón (Au), etc.

ÁREAS PROSPECTIVAS DE BOLIVIA



FAJA POLIMETÁLICA DEL ALTIPLANO Y DE LA CORDILLERA OCCIDENTAL



TIPOS DE YACIMIENTOS

- Vetiformes (y diseminados) epitermales (volcanogénicos)
- Estratiformes o estratoligados asociados a redbeds
- Vetiformes (y diseminados) polimetálicos "de tipo boliviano"
- Vetiformes asociados a series sedimentarias
- Epiporfídicos
- Placeres

Elementos prospectables:
Au, Cu, Zn, Pb, Ag, Sn, Sb, Li, B

FAJA POLIMETÁLICA DEL ALTIPLANO Y DE LA CORDILLERA OCCIDENTAL

PROYECTOS EN DESARROLLO

KORI CHACA (Au)

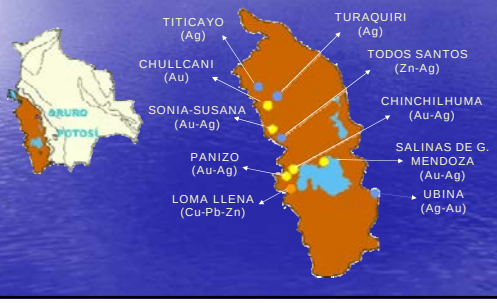
UBICACIÓN
Ciudad de Oruro
PROPIETARIO
EMIRSA-Newmont
TIPO DE DEPÓSITO
Vetiforme y stockwork, asociado a rocas sedimentarias paleozoicas
POTENCIAL
13.12 Mt con una ley de 0,80 g/t Au
RESERVAS
340.000 Oz Troy Au
224.000 Oz Troy Au (recuperable)
INVERSIÓN
17,9 M $us
PRODUCCIÓN PROYECTADA
7 t en 6 años

SAN CRISTOBAL (Ag-Zn)

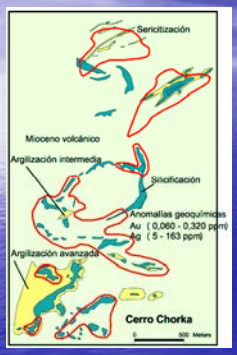
UBICACIÓN: 306 km al SW de la ciudad de Potosí
PROPIETARIO: Andean Silver
TIPO DE DEPÓSITO: Vetiforme epitermal (volcanogénico)
ELEMENTOS: Ag, Zn y Pb
POTENCIAL: Depósito de clase mundial
Reservas: 219 – 470 M Oz troy Ag; 1,8 Mt Zn; 0,6 Mt Pb
Leyes: 65,8 g/t Ag; 1.63 % Zn; 0,61 % Pb
PRODUCCIÓN PROYECTADA: 40.000 t/d
INVERSIÓN: 1000 M $us

FAJA POLIMETÁLICA DEL ALTIPLANO Y DE LA CORDILLERA OCCIDENTAL

PROYECTOS EN FASE DE EXPLORACIÓN



SALINAS DE GARCI MENDOZA (Au - Ag)



UBICACIÓN

- 350 Km al SW de la ciudad de La Paz

TIPO DE DEPÓSITO

- Epitermal tipo sulfato ácido y sulfuración intermedia

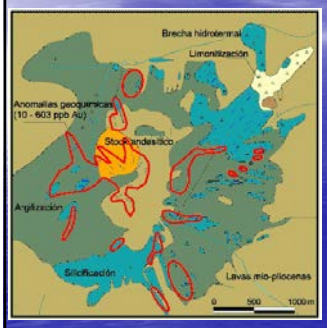
ELEMENTOS

- Au – Ag

POTENCIAL

- Zona de 2 x 3,5 km - anomalías de oro entre 80 y 320 ppb
- Zonación de alteración similar a Lepanto (Filipinas)

CHULLCANI (Au)



UBICACIÓN

- 175 km al oeste de la ciudad de Oruro

TIPO DE DEPÓSITO

- Epitermal

ELEMENTOS

- Au

POTENCIAL

- Zona de alteración de 6,5 km2; anomalías de Au (10 – 603 ppb)

SONIA – SUSANA (Au-Ag)

UBICACIÓN

230 km al SW de la ciudad de La Paz

TIPO DE DEPÓSITO

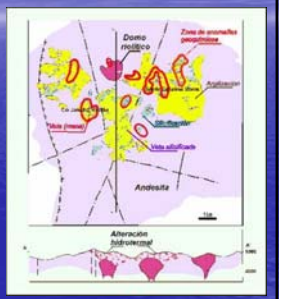
Epitermal (epipórfido) y polimetálico

ELEMENTOS

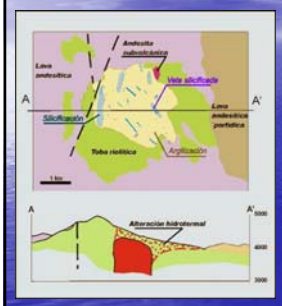
Au-Ag-[Cu-Zn]

POTENCIAL

- Área de alteración de 12 km2
- Stockworks y vetillas silicificadas con contenidos anómalos de Au, Ag, Zn, Cu



CHINCHILHUMA (Au-Ag)



UBICACIÓN

350 km al SW de la ciudad de La Paz

TIPO DE DEPÓSITO

Epitermal

ELEMENTOS

Au-Ag-[Zn-Cu]

POTENCIAL

- Zona de alteración de 5 km2
- Filones y brechas hidrotermales con contenidos anómalos a sub-económicos de Ag (209,5 g/t); Pb (11,7%); Zn (6,38%) y Au (1,31 g/t)

PANIZO (Au-Ag)

UBICACIÓN

380 Km al SW de la ciudad de La Paz

TIPO DE DEPÓSITO

Epitermal tipo sulfato ácido

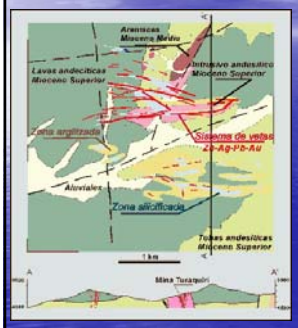
ELEMENTOS

Au, Ag, Cu

POTENCIAL

- Zona de alteración de 20 km2
- Filones, chimeneas y brechas hidrotermales silicificadas, con contenidos anómalos de Au (441 ppb) y Ag (56 ppm)

TURAQUIRI (Ag)



UBICACIÓN

135 km al oeste de la ciudad de Oruro

TIPO DE DEPÓSITO

Epitermal

ELEMENTOS

Ag-Pb-Zn-Cu-[Au]

POTENCIAL

- Area de alteración de 4 km2
- Sistema de vetas espaciadas de 10 a 40 m, con contenidos sub-económicos a económicos de Ag (2157 ppm); Zn (1,5%) y Au (3,53 ppm)

TODOS SANTOS (Zn-Ag)

UBICACIÓN

220 Km al SW de la ciudad de La Paz

TIPO DE DEPÓSITO

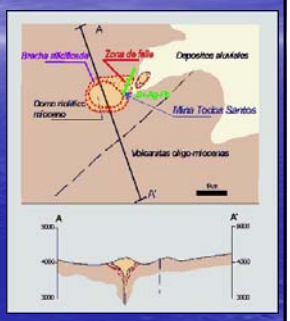
Polimetálico tipo boliviano

ELEMENTOS

Zn-Pb-Ag

POTENCIAL

Mineralización asociada a una zona de falla de 350 m de longitud y 30 m de ancho, con valores de Ag (240 g/t), Zn (6,4%) y Pb (2%)



TITICAYO (Ag)

UBICACIÓN

- 150 km al SW de la ciudad de La Paz

TIPO DE DEPÓSITO

- Epitermal (Polimetálico)

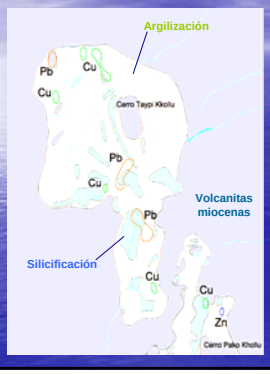
ELEMENTOS

- Ag – Zn – Pb

POTENCIAL

- Zona de alteración de 5 km^2; contenidos anómalos a subeconómicos de Ag (143 – 221 ppm)

LOMA LLENA (Cu-Pb-Zn)



UBICACIÓN

- 400 km al S de la ciudad de La Paz

TIPO DE DEPÓSITO

- Epitermal

ELEMENTOS

- Cu-Pb-Zn

POTENCIAL

- Zona de alteración de 6 km²; zonas de brecha hidrotermal con contenidos anómalos de Cu, Pb y Zn

UBINA (Ag-Au)

UBICACIÓN

- 150 km al SW de la ciudad de La Paz

TIPO DE DEPÓSITO

- Epitermal (Polimetálico)

ELEMENTOS

- Ag – Zn – Pb

POTENCIAL

- Zona de alteración de 5 km²; contenidos anómalos a subeconómicos de Ag (143 – 221 ppm)

FAJA POLIMETÁLICA DEL ALTIPLANO Y DE LA CORDILLERA OCCIDENTAL

PROYECTOS EN FASE DE LICITACIÓN

SALAR DE UYUNI (Li-B)

UBICACIÓN
241 km al SW de la ciudad de Potosí

TIPO DE DEPÓSITO
Evaporítico

ELEMENTOS
Li, B, K, Mg

POTENCIAL
Superficie: 10.500 km² de costra salina

RESERVAS
Li: 8.9 Mt
B: 7.7 Mt
K: 194 Mt
Mg: 211 Mt

INVERSIÓN ESTIMADA
50-300 M $us

FAJA ESTAÑÍFERA

TIPOS DE YACIMIENTOS

- Vetiformes (y diseminados) polimetálicos "de tipo boliviano"
- Vetiformes (y diseminados) epitermales (volcanogénicos)
- Placeres

ELEMENTOS PROSPECTABLES

Sn, Ag, Zn, Pb, Au, Cu, Bi

FAJA ESTAÑÍFERA

PROYECTOS EN DESARROLLO

CERRO RICO DE POTOSÍ (Ag-Zn)

UBICACIÓN
3 km al Sur de la Ciudad de Potosí

TIPO DE DEPÓSITO
Stock work y vetiforme polimetálico de tipo boliviano

ELEMENTOS
Ag, Zn, Sn

RESERVA MINERALIZABLE
54 Mt con una ley de 182 g/t Ag
Recuperación: 85%

SAN BARTOLOMÉ (Ag-Sn)

UBICACIÓN
Ciudad de Potosí

PROPIETARIO
COEUR D´ALENE - Manquiri

TIPO DE DEPÓSITO
Secundario (coluvial y aluvial)

ELEMENTOS
Ag, Sn

POTENCIAL
30 Mt con 90 a 120 g/t Ag

PRODUCCIÓN ANUAL
4 a 7 M Oz troy Ag

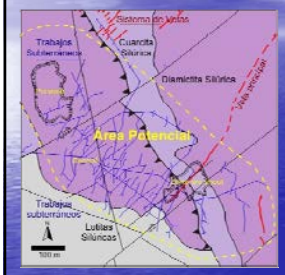
VIDA ÚTIL
10 años

INVERSIÓN
135 M $us

SAN VICENTE (Ag-Zn)

UBICACIÓN: 370 km al SSW de la ciudad de Potosí
PROPIETARIO: Panamerican Silver Corporation - EMUSA
TIPO DE DEPÓSITO: Vetiforme polimetálico de tipo boliviano
ELEMENTOS: Ag, Zn
ÁREA POTENCIAL: 15 km de largo x 1km de ancho
LEYES: 2,45 % Zn; 156 g/t Ag
PRODUCCIÓN PROYECTADA: 1.000 t/d
VIDA ÚTIL: 10 años
INVERSIÓN: 35 M $us

JAPO (Sn)



UBICACIÓN
- 300 Km al SE de la ciudad de La Paz

TIPO DE DEPOSITO
- Vetiforme asociado a series sedimentarias
- Vetiforme polimetálico de tipo boliviano

ELEMENTOS
- Sn - Zn - Ag - Au

POTENCIAL
- 36Mt con una ley de 0,46%Sn

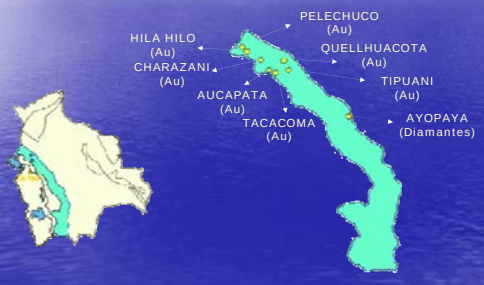
FAJA POLIMETÁLICA MARGINAL DE LA CORDILLERA ORIENTAL

TIPOS DE YACIMIENTOS
- Vetiformes asociados a series sedimentarias
- Vetiformes asociados a plutones félsicos
- Vetiformes (y diseminados) epitermales (volcanogénicos)
- Vetiformes (y diseminados) polimetálicos “de tipo boliviano”
- Estratoligados formados en ambientes orogénicos
- Volcano-sedimentarios (de sulfuros masivos volcanogénicos y/o sedex)
- Sedimentarios químicos
- Asociados a intrusiones alcalinas
- Placeres auríferos

ELEMENTOS PROSPECTBLES
Au, Zn, Cu, Ag

FAJA POLIMETÁLICA MARGINAL DE LA CORDILLERA ORIENTAL

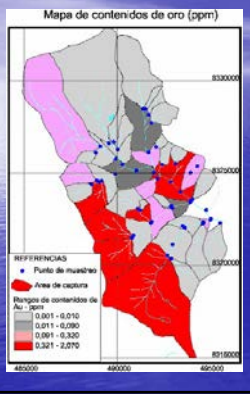
PROYECTOS EN FASE DE EXPLORACIÓN



DISTRITO QUELLHUACOTA (Au)

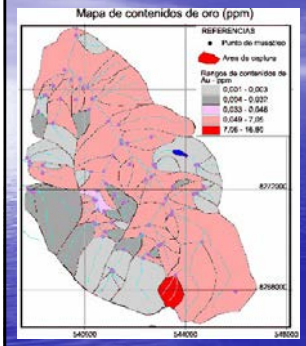
Tipo de depósito: Mantos auríferos concordantes con la estratificación
Litología: Lutitas y areniscas ordovícicas
Alteraciones: Silicificación, piritización y limonitización
Mineralización: Cuarzo gris aurífero, asociado a pirita y arsenopirita
Geoquímica: Anomalías de oro (0,1 a 0,17 ppm) en sedimentos de corriente
Potencial
Mantos cuarzo-auríferos localizados al NE del distrito

DISTRITO CHARAZANI (Au)



Tipos de depósitos: Vetas, mantos y depósitos fluvio-glaciales
Litología: Lutitas y areniscas paleozoicas y rocas graníticas del Complejo Ígneo de Charazani
Alteraciones: Silicificación, piritización y limonitización
Mineralogía: Pirita, arsenopirita, calcopirita, galena argentífera, esfalerita, hematita y limonita
Geoquímica de suelos: 0,643 ppb Au (valor máximo)
Potencial Prospectivo
Zona NE: Vetas polimetálicas
Zona W: Mineralización aurífera secundaria

DISTRITO TACACOMA (Au)



Tipos de depósitos: Vetas, manto y placeres
Litología: Lutitas paleozoicas
Alteraciones: Silicificación, cloritización y sericitización
Mineralización:
- Cuarzo, pirita, calcopirita, pirrotina, arsenopirita, esfalerita, galena, goetita, calcosina, y malaquita
- Vetas de 0,15 a 7 m de potencia y entre 100 m y algo más de 1 km de largo

Anomalías geoquímicas orientativas:
Mina San Vicente: 22,7 g/t Au
Mina San Jorge: 34,7 g/t Au
Mina Santa Elena: 45,6 g/t Au
Challapata: 4,64 ppm Au; 21 g/t Ag; 10,5 % Cu

DISTRITO AUCAPATA (Au)

Tipos de depósitos: Vetas, mantos, stockwork y tipo placer
Litología: Lutitas, areniscas y cuarcitas paleozoicas
Alteraciones: Silicificación, cloritización y limonitización asociada a diseminación de pirita
Mineralogía: Cuarzo, pirita, arsenopirita, calcopirita, pirrotina, covelina y limonita

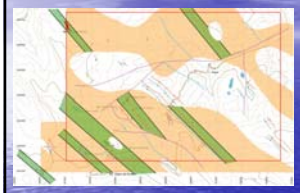
Anomalías geoquímicas orientativas
Huanco: 0,37 g/t Au; 15,2 g/t Ag y 11,7 % Cu
Suamani: 72,2 g/t Au
Warístakani: 1,55 g/t Au; 11,1 g/t Ag y 3,57 % Cu

DISTRITO PELECHUCO (Au)

Tipos de depósitos: mantos y vetiformes
Litología: Lutitas y areniscas paleozoicas
Alteraciones: Cloritización, carbonatación y oxidación
Mineralización: Cuarzo, pirita, marcasita, calcopirita, arsenopirita, galena y pirrotina
Anomalías geoquímicas orientativas:
Mantos: 0,62-6,63 g/t Au; 0,09-0,13 g/t Ag
Vetas: 0,003-7,75 g/t Au; 0,01- 0,19 g/t Ag

Potencial:
Anticlinal regional NW, en cuyo eje se exponen mantos y vetas (minas Rayo Rojo, Turcos, Quisani, y Tata Santiago)

DISTRITO HILO HILO (Au)



Tipos de depósitos:
Vetas y mantos cuarzo-auríferos
Litología: Lutitas y areniscas paleozoicas
Alteraciones: Piritización, silicificación, oxidación y carbonatización
Mineralización: Cuarzo, pirrotina, arsenopirita, pirita, marcasita, calcopirita, galena y esfalerita
Anomalías geoquímicas orientativas:
Mantos: 0,001-49,7 g/t Au; 0,02-6,1 g/t Ag
Vetas: 0,007-35,7g/t Au; 0,01- 0,98 g/t Ag

Potencial:
Anticlinales en cuyo eje están expuestos mantos y vetas (minas Caballo Blanco, Khori Huari, Las Minas, Virgen del Rosario y Sunchulí)

TIPUANI (Au)

UBICACIÓN
259 km al NNE de la ciudad de La Paz
TIPO DE DEPÓSITO
Placeres auríferos
ELEMENTOS
Au
POTENCIAL
Lecho aurífero de 170 km de largo sobre el río Tipuani
RESERVAS
100.000 oz de Au anuales

Fuente: Revista Khrysos

PROVINCIA ALCALINA DE AYOPAYA (Diamantes)

UBICACIÓN
150 km al SE de la ciudad de La Paz
TIPO DE DEPÓSITO
Ocurrencia de diamantes en placeres y en kimberlitas asociadas a carbonatitas, diques máficos a ultramáficos
ELEMENTOS
Diamante
DEPÓSITOS COMPARABLES
Mundial
Depósito de Chagatai en Uzbekistan, Asia Central

CUENCA AURÍFERA AMAZÓNICA

AMBIENTE GEOLÓGICO

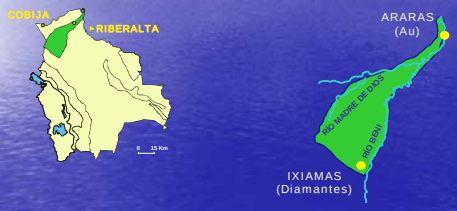
Depósitos aluviales de oro nativo en gravas , de granulometría fina a muy fina y de gran pureza.

Ocurre en forma de laminillas, gránulos y polvo.

TIPO DE YACIMIENTO
Placeres
ELEMENTOS
Au

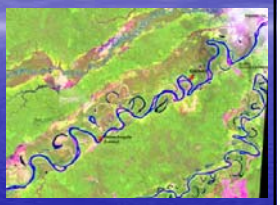
CUENCA AURÍFERA AMAZÓNICA

PROYECTOS EN FASE DE EXPLORACIÓN



ARARAS (Au)

UBICACIÓN
Departamentos de Pando y Beni, 100 km al NE de Riberalta



TIPO DE DEPÓSITO
Placeres auríferos
ELEMENTOS
Au
POTENCIAL
855 Mm3 con un promedio aprox. de 0,3-0,5 g/m3 Au
Corresponde a una décima parte del potencial aluvial del valle Alto Madera

DISTRITO IXIAMAS (Diamantes)

UBICACIÓN
300 km al N de la ciudad de La Paz
TIPO DE DEPÓSITO
Ocurrencia de diamantes en placeres
ELEMENTOS INDICADORES
Granates, ilmenitas y cromitas
POTENCIAL
200 Mm^3
DEPÓSITOS COMPARABLES
Mundial
República de Sudáfrica

FAJA AURO-MANGANESÍFERA DEL CRATÓN DE PARAGUÁ

TIPOS DE YACIMIENTOS

- Vetiformes asociados a plutones félsicos
- Vetiformes asociados a series sedimentarias metamorfizadas
- Asociados a intrusiones alcalinas
- Volcano–sedimentarios (sulfuros masivos volcanogénicos y/o sedex)

ELEMENTOS PROSPECTABLES

Au, Cu, Mn

FAJA AURO-MANGANESÍFERA DEL CRATÓN DE PARAGUÁ

PROYECTOS EN FASE DE EXPLORACIÓN

SAN SIMÓN (Au)

UBICACIÓN

450 km al NE de la ciudad de Santa Cruz

PROPIETARIO

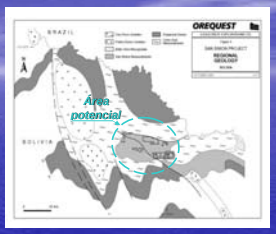
Eaglecrest Explorations

TIPO DE DEPÓSITO

Vetas cuarzo-auríferas mesotermales asociadas a rocas sedimentarias proterozoicas de bajo grado metamórfico

POTENCIAL

Vetas discontinuas de 12 m de espesor máximo emplazadas en zonas cizalladas de 4 km de largo. Se reportaron leyes de hasta 486 g/t Au.



FAJA POLIMETÁLICA SUNSAS

TIPOS DE YACIMIENTOS

- Volcano –sedimentarios
- Vetiformes asociados a plutones félsicos
- Asociados a intrusiones ultramáficas a máficas

ELEMENTOS PROSPECTABLES

Au, Cu, Ni, Pd, Pt

FAJA POLIMETÁLICA SUNSAS

PROYECTOS EN FASE DE EXPLORACIÓN

MIGUELA (Au-Cu)

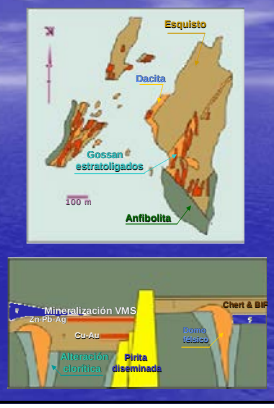
UBICACIÓN
200 km al N de la ciudad de Santa Cruz

TIPO DE DEPÓSITO
Sulfuros masivos volcanogénicos

ELEMENTOS
Au, Cu, Zn

POTENCIAL
Cinturón discontinuo NW-SE de esquistos volcano–sedimentarios de 120 km de largo x 40 km de ancho

RECURSOS
1,6 Mt con 1,26 g/t Au y 3,76% Cu



RINCON DEL TIGRE (PGE, Ni)

UBICACIÓN
500 km al E de la ciudad de Santa Cruz

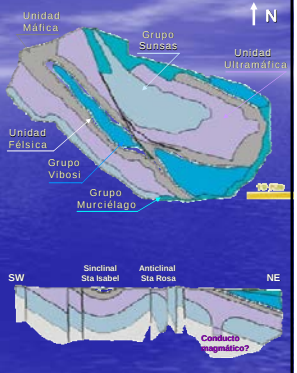
TIPO DE DEPÓSITO
Asociado a intrusiones máficas a ultramáficas

ELEMENTOS
PGE, Ni

POTENCIAL
Megasill bandeado de composición ultramáfica a máfica, con un área potencial en PGE de 125 km²

ANOMALÍAS GEOQUÍMICAS
1,8 g/t Pd; 0,68 g/t Pt y 0,35 g/t Au

Se estima un potencial de Ni en horizontes lateríticos



FAJA FERRO - MANGANESÍFERA DE MUTÚN-TUCAVACA

TIPOS DE YACIMIENTOS
- Sedimentarios químicos
- Estratoligados de tipo Mississippi Valley

ELEMENTOS PROSPECTABLES
Fe, Mn, Zn, Pb

FAJA FERRO - MANGANESÍFERA DE MUTÚN-TUCAVACA

PROYECTO EN FASE DE EXPLORACIÓN

CUENCA TUCAVACA (Zn-Pb-Cu)

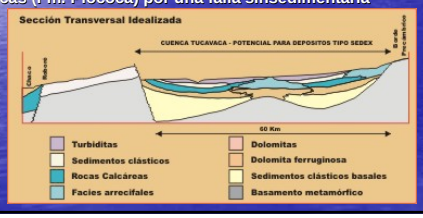
Ubicación: Departamento de Santa Cruz

Ambiente geológico: Rift intracratónico de segundo orden formado por tectonismo vertical sinsedimentario

Tipo de depósito: Exhalativo – sedimentario (SEDEX) masivo y de gran volumen

Mineralización:

- Cu-Zn asociada a una secuencia clástico-calcárea (Fm. Pororó) y a la zona de falla de la Línea Chiquitos
- Zn-Pb asociada a lutitas (Fm. Pesenema) en contacto con areniscas (Fm. Piococa) por una falla sinsedimentaria



EL MUTÚN (Fe-Mn)

UBICACIÓN:
Departamento de Santa Cruz
110 Km de Puerto Busch y 12 Km del gasoducto

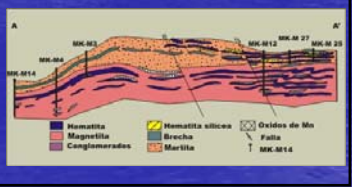
TIPO DE DEPÓSITO:
Sedimentario químico

ELEMENTOS: Fe, Mn

POTENCIAL:
40 m Mt con 50-55% Fe

OPERADOR:
En proceso de Licitación Internacional

INVERSIÓN ESTIMADA:
200 A 600 M $us



BOLIVIA
UN PAÍS MINERO VIGENTE

GRACIAS POR SU ATENCIÓN....

SERVICIO NACIONAL DE GEOLOGIA Y TÉCNICO DE MINAS

PROYECTO BIBLIOTECA VIRTUAL

SERGEOTECMIN

DIFUSION DE INFORMACION MEDIANTE LA BIBLIOTECA VIRTUAL

1

ANTECEDENTES

A partir del año 2002, SERGEOTECMIN con el auspicio de la Agencia Canadiense de desarrollo internacional (ACDI) y del Ministerio de Recursos Naturales de Fauna y Parque de Québec (Canadá), viene ejecutando el subcomponente IMAGENERIA del proyecto de Reformas a la Industria Minera (REFORMIN), que tiene entre sus objetivos principales la implementación de una biblioteca virtual, con información geocientífica del Centro de Documentación de SERGEOTECMIN.

2

VENTAJAS

- Los sistemas digitales tienen la gran ventaja de hacer compartir los datos entre muchos usuarios.
- El formato digital permite visualización y modelado en el software.
- Los sistemas digitales hacen factible el procesamiento rápido de grandes volúmenes de información.
- La preservación y mantenimiento de la documentación manejada digitalmente es óptima.

3

VENTAJAS

- Los costos de reproducción de esta información en formato analógico o digital son bajos.
- El alcance de la difusión por Internet es universal y abre nuevos horizontes.
- Alto nivel de seguridad de la información almacenada y entregada (liberación de archivos exclusivamente con pedido mediante el sistema).

4

OBJETIVOS GENERALES

El manejo óptimo de la información geocientífica, mediante el diseño e implementación de un sistema de difusión y producción digital que permite y facilita el almacenamiento, publicación y difusión irrestricta de la información con que cuenta SERGEOTECMIN en su centro documental.

OBJETIVOS ESPECÍFICOS

•Atracción de capitales para inversiones en minería y otras áreas relacionadas con los recursos naturales.

•Difusión irrestricta de la geoinformación de SERGEOTECMIN, mediante sistemas geomáticos con tecnología de punta al mercado nacional e internacional con mejores condiciones que otras instituciones dedicadas al mismo rubro.

•Transformación de la información analógica a digital (informes, mapas) con que cuenta SERGEOTECMIN y su posterior puesta a disposición, utilizando para este propósito un sitio web.

ALCANCES

Implementación de la Biblioteca Virtual de SERGEOTECMIN que actualmente incluye:

5.504 Documentos
109.684 Páginas
8.531 Mapas

ALCANCES

Implementación de una nueva política de precios, con la estandarización de precios:

Páginas Color y Blanco/Negro 0.10 $us
Mapas Blanco/Negro 5 $us
Mapas Color 10 $us

ALCANCES

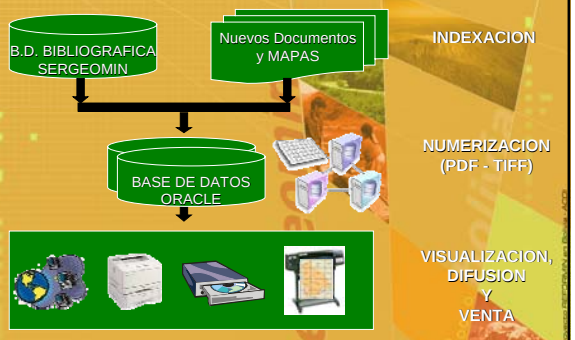
Información incluida,
Clasificación de la información de acuerdo a las Siguientes áreas:

Geología	Geofísica
Minería	Geoquímica
Medio Ambiente	Hidrología
Hidrogeología	Exploración Minera
	Contaminación

METAS

- BIBLIOTECA VIRTUAL
- PRODUCTOS FORMATO DIGITAL Y/O PAPEL
- COMERCIO ELECTRONICO
- OPTIMIZACIÓN EN LA ENTREGA DE PRODUCTOS (24 HORAS)
- ESTANDARIZACION DE PRECIOS
- MAYOR CALIDAD DE PRODUCTOS FINALES (recuperación de documentos en mal estado)

METODOLOGIA DE TRABAJO

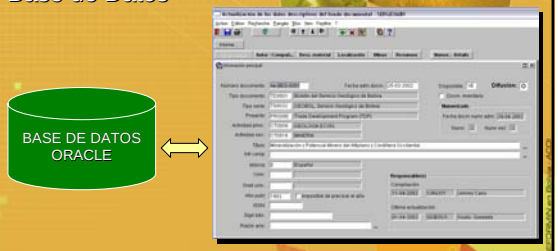


ETAPAS

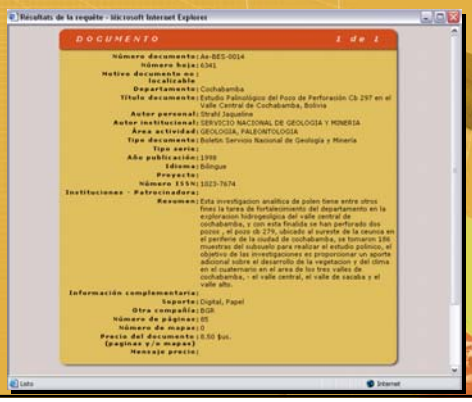
- **PREPARACION DE DOCUMENTOS**
  Reacondicionamiento de documentos
- **INDEXACION**
  Alimentación de la Base de Datos
- **NUMERIZACION**
  Transformación de la información, de formato analógico a digital
- **DIFUSION**
  Internet
- **ACCESO A LA INFORMACION**
  Internet

INDEXACION

- Alimentación de la Base de Datos



INDEXACION



INDEXACION

NUMERIZACION

- Es la transformación de formato analógico a digital y su posterior tratamiento (reducción de tamaño de archivos, calidad, etc)

NUMERIZACION

- Separación páginas/mapas

NUMERIZACION

- Escaneo páginas/mapas

NUMERIZACION

- Tratamiento de mapas

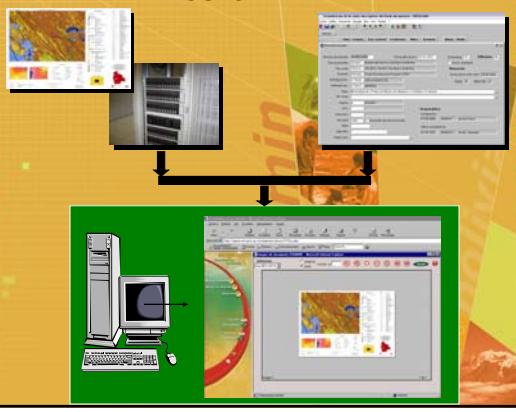
NUMERIZACION

- Control de Calidad

NUMERIZACION

- Almacenamiento

DIFUSION EN LINEA



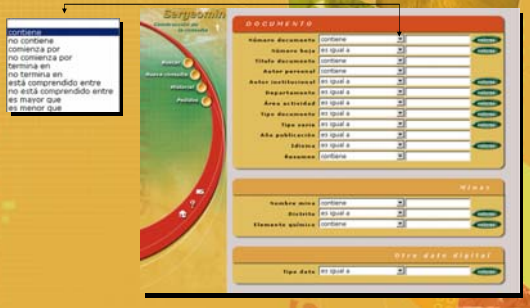
ACCESO A LA INFORMACION

- Página WEB

www.geoinformacion.gov.bo

ACCESO A LA INFORMACION

- Consulta Literal

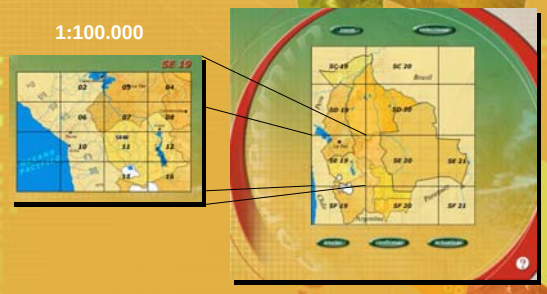


ACCESO A LA INFORMACION

- Consulta grafica

1:250.000

1:100.000



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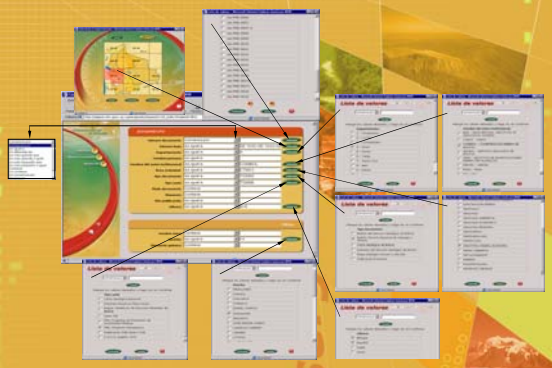
ACCESO A LA INFORMACION



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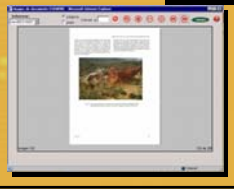
ACCESO A LA INFORMACION

DOCUMENTO COMPLETO

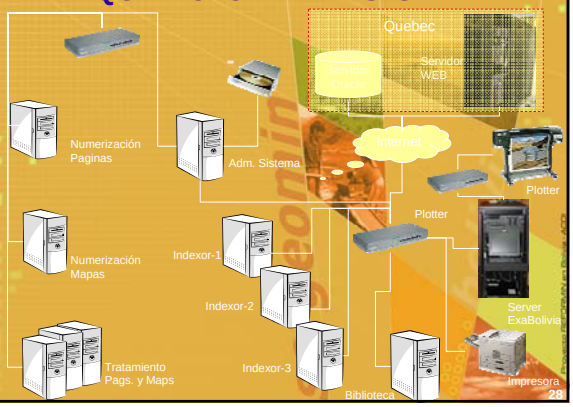
PAGINAS



MAPAS

27

ARQUITECTURA DEL SISTEMA



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PRODUCTOS

- Sistema de difusión de información geocientífica de Bolivia
- Sistema de Reproducción de documentos
- Nueva política de precios
- Biblioteca virtual

www.geoinformacion.gov.bo

Sistema de Produccion Exa-Bolivia

GRADO DE AVANCE

- Posicionamiento a nivel internacional

EXPONOR 2005
(Antofagasta, Chile)

PROEXPLO 2003,2005
(Lima, Perú)

QUEBEC EXPLORATION 2004
(Québec, Canadá)

GRADO DE AVANCE

- Posicionamiento a nivel internacional

ARGENTINA MINING, 2004
(Mendoza, Argentina)

PDAC 2002, 2003, 2004
(Toronto, Canadá)

PERSPECTIVAS

- Incluir la información existente en las regionales de SERGEOTECMIN (Santa Cruz, Cochabamba y Oruro)
- Adjuntar otras bibliotecas geocientíficas a la biblioteca virtual (COMIBOL, YPFB, UMSA, etc.)
- A partir de este primer ciclo de integración geomática, SERGEOMIN, tendra que dirigirse hacia otro de georeferenciación espacial en la producción de mapas digitales a través de S.I.G. Integrar sistemas de Imageneria y S.I.G. en un solo sistema que permita la difusión, mediante el sitio Internet de REFORMIN

Gracias por su atención!!!

No olvide visitar nuestro sitio:

www.geoinformacion.gov.bo

Licensing system in Greenland

Government of Greenland – and until recently also the Danish Government - is making efforts to develop the mineral industry in Greenland

The aim is to boost the mineral industry with the aim of making Greenland economically more self-sufficient

Development of the resources must be carried out with respect to the environment

An important fact: no private land in Greenland

Administration system

- Government of Greenland
  – Bureau of Minerals and Petroleum (BMP)
- Application, administration of licences and regulation of activities is conducted by the BMP
- BMP takes care of co-ordinating hearings and processing by other authorities
- Mineral industry has to deal with one authority only
- GEUS carries out the registration of license areas on map, calculates the area (km^2) and overlap checking
- GEUS provides geological expertise and consultancies, and undertakes inspections of the activities

Mineral licences

Prospecting licence (non-exclusive) granted for large areas for a 5-year period

Exploration license (exclusive) granted for a 5-year period

Special 3-year exploration license (exclusive) for large areas in North and East Greenland with reduced work commitments

Exploitation licence (thirty years)

Exploration licence terms

- Covers all mineral resources except HC and radioactive minerals
- Licence area delineated by map claiming (E-W and N-S)
- Licence is granted for 5 year period (5+5+2+2+2) for same area
- Licence fees per licence and size
- Work commitment per calendar year (fixed + per km^2)
- Certain exploration activities need approval by BMP
- Licence shall forward a field report to BMP
- License is entitled to be granted to exploition licence

Exploration obligations

An amount per licence per calendar year as follows:

- Years 1-2: DKK 100,000
- Years 3-5: DKK 200,000
- Years 6-10: DKK 400,000

An amount per km^2 per calendar year as follows:

- Years 1-2: DKK 1,000
- Years 3-5: DKK 5,000
- Years 6-10: DKK 10,000

Inspection: Normally BMP does not intend to inspect the activities. Inspections will normally be conducted in case of drilling programs, blasting, underground exploration etc.

Reporting

ENRECA Enhanced Research Capacities

A brief introduction to ENRECA

ENRECA Aim

The Danish Ministry of Foreign Affairs once a year invites applications for research grants related to research concerning developing countries.

The objective is to generate knowledge to reduce poverty.

Grants may by awarded for research in fields in which research and new knowledge may contribute to solving the problems of developing countries.

ENRECA conditions

Grants will only be awarded:

• for research programmes within developing countries that are lying under the GNI threshold set by the World Bank (UDS 2,470 per capita 2007)

• and towards development research in Danish programme countries.

ENRECA Introduction

Enhancement of **Re**search **Ca**pacity

The ENRECA projects function as cooperation between researchers at a Danish institution and a partner institution in one of Danida's programme countries.

They work together on building research capacity in the country concerned. Capacity building projects are not expected to yield the same research output as the research projects. By contrast, the goal is to help partners to reach a research level where they will be able to contribute to promoting their country's poverty reduction and development.

ENRECA Introduction 2

A successful application requires

Well defined – and relevant – project

Strong research and institutional partners in Bolivia

Strong research and institutional partners in Denmark

Strong support from relevant Bolivian governmental bodies

Strong support from European representations based in Bolivia – in particular the Danish Embassy

ENRECA – Problem 1

Deadline for larger projects and PhD and postdoc applications is Friday, 13 February 2009.

Danida Fellowship Centre
Research Unit
Hostrupsvej 22
DK-1950 Frederiksberg
Questions about the application procedure can be directed to the Research Unit, Danida Fellowship Centre at e-mail: research@dfcentre.dk

ENRECA – Problem 2

Theme 2: Climate, energy and sustainable use of natural resources

Globally, there is a growing acknowledgement that energy and natural resource management, combined with climate change significantly will affect the development in poor countries. Relevant areas of research would be on sustainable energy consumption and the possibilities of developing countries adapting to climate change, primarily in relation to Africa. Applications may also focus on potential adaptation strategies for developing countries in order to address climate change. This could include the prerequisites for institutional, planning and decision-making, the possibilities and limitations in the use of sustainable energy, including the perspectives of the use of bio-fuels and other energy sources and finally, the socio-economic and environmental consequences of more intensive energy consumption and of climate change.

ENRECA – Our experience

GEUS is presently involved in the three ENRECA projects:

- Capacity building to the energy sector in Vietnam
- Capacity building to the water sector in Vietnam
- Capacity building to the water sector in Ghana

ENRECA – Our experience

The application process is time consuming – not less than three months.

The chance of approval is in the range of 15%

The projects are typically granted for three years, with the option to apply for extension twice.

ENRECA Our experience

Budget items example

- Salaries, emoluments & taximeter grants
- Travel and subsistence
- Project and research equipment
- Materials, running costs & services
- Publication and dissemination
- Administration (<20%)

Amount: Grants up to US$ 1.5 mio. have been given

ENRECA Conclusion

More discussions are required to decide if an ENRECA project is relevant in order to boost the mining sector in Bolivia.

ENRECA

Initiative Grants: Aim at preparing applications for ENRECA projects or major research projects with institutions in developing countries, and covers expenses for meetings and travel.

ENRECA

GEUS

Danida Fellowship Centre
Research Unit
Hostrupsvej 22
DK-1950 Frederiksberg
Denmark

Att. Dr. Bente Ilsøe
Phone: +45 35248461
E-mail: research@dfcentre.dk

Small-scale mining

Peter W.U. Appel
Geological Survey of Denmark and Greenland
(GEUS)
pa@geus.dk

>100 million people depend on small-scale mining

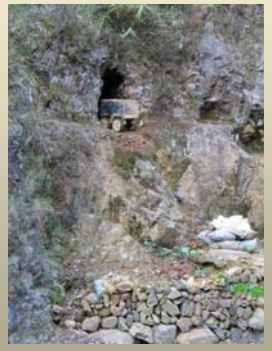
Commodities extracted by small-scale miners

Metals	% mined	Industrial minerals	% mined
Beryllium	100	Fluorite	90
Mercury	90	Graphite	90
Tungsten	80	Talc	90
Chromium	50	Vermiculite	90
Antimony	45	Pumice	90
Manganese	18	Feldspar	80
Tin	15	Clay	75
Iron	12	Gypsum	70
Lead	11	Barite	60
Zinc	11	Sand and gravel	30
Cobalt	10	Dimension stones	30
Gold	10	Salt	20
Silver	10	Coal	20
Copper	8	Phosphate	10

Countries were GEUS has worked on small-scale mining issues

- Kyrgyz Republic
- Mongolia
- Philippines
- Lao PDR
- Tanzania
- Zambia
- Mali
- Sudan
- Lesotho

Small-scale gold mining in hard rock

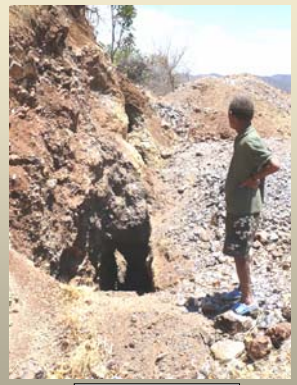


Philippines

Gold in hard rock

Tanzania

Gemstone in Zambia



Aquamarine

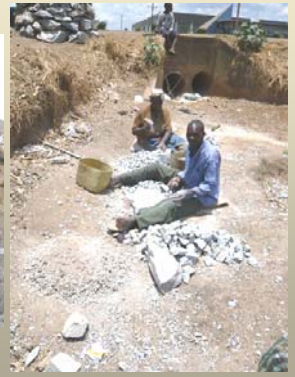
Amethyst

Coal in Mongolia

Tin

Lao PDR

Dolomite in Zambia



Advantages and disadvantages of small-scale mining

- Provides income in rural areas
- Reduces urbanisation
- Increase links between urban and rural areas
- Contributes to the overall economy of the country

- Causes environmental problems
- Health problems
- Crime rate increases

GEUS projects in small-scale mining

- Baseline studies of environmental problems caused by small-scale mining
- Teaching and training of small-scale miners in recognising effects of toxic compounds used during their activities.
- Evaluation of working methods used by small-scale miners and development of best available technique (BAT)
- Teaching and training of medical doctors and other health providers
- Workshops for stakeholders

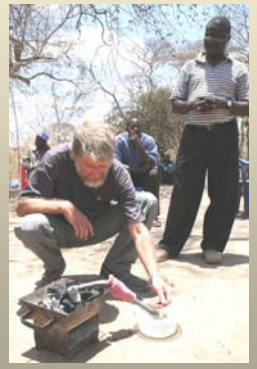
Gold extraction by mercury/amalgamation

GEUS

Amalgamation

GEUS

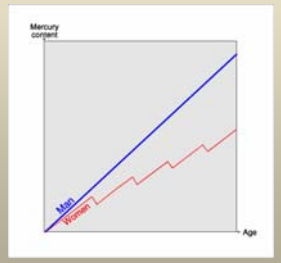
Teaching and training



During a period of one month a small group of small-scale miners recovered more than 10 kg of mercury by using the retort

GEUS

Mercury toxicity



GEUS

Philippines
Teaching school children

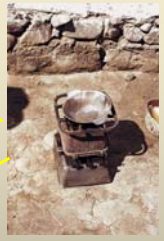
Phillippines
Next generation

Two small girls (10 and 11) came after our teaching in their school and asked whether it was correct that they probably had a lot of mercury in their body. I said that it was probably true, and that they should ask their parrents to come to my teaching lessons next day.

Gold extraction without mercury

- Acid extraction
- Borax

Acid treatment



The borax method offers an inexpensive fairly easy way out of this situation

Blow torch

Conflict resolution

Kyrgyz Republic

Tanzania

ANNEX 6 PowerPoint presentation – concluding meeting

GEUS

The Mission:

IDENTIFICACIÓN DE OPORTUNIDADES PARA LA PROMOCIÓN DEL SECTOR MINERO EN BOLIVIA

Undertaken by Peter W. U. Appel and Per Kalvig, GEUS, Denmark

In the period from January 16th – 4th February, 2009

GEUS

Background

Bolivia has for hundreds of years been a dominating player in the World market of silver, tin, antimony, tungsten, and zinc as well as other metals.

Bolivia has as other countries been hit by the market collaps in some of these commodities.

Bolivia has - as opposed to its neighbours - not recovered its status as a major player on the world mining scene.

Promotion of the Bolivian minerals potential

GEUS

Background

- The number of concessions have been almost steady
- The total concession area have diminished
- Very few operating foreign exploration companies
- Due to high prices over the past five years, net-income has increased, but
- Contribution from the mining sector towards GNP has declined over the past two decades

Promotion of the Bolivian minerals potential

GEUS

Background

In order to find new avenues towards reviving exploration and exploitation by foreign companies, COMIBOL and the Danish Embassy, La Paz, agreed to call for a second opinion from the Geological Survey of Denmark and Greenland (GEUS).

Promotion of the Bolivian minerals potential

GEUS

Why GEUS?

GEUS is an independent of any local interests in Bolivia.

GEUS has for decades been involved in promoting mineral resources on behalf of Greenland, and is widely used as independent consultant in the developing countries.

Promotion of the Bolivian minerals potential

GEUS

The mission program undertaken:

- Workshop – presentations of stakeholders
- Meetings with key stakeholders
- Visits to various operators in the Oruro district
- Meetings with universities
- Meetings with aid organisations

Promotion of the Bolivian minerals potential

GEUS

FINDINGS 1

- Well established and competent government organisations (MMM, COMIBOL, Sergeotecmin)
- Very open-minded and dedicated staff
- A strong interest among MMM,COMIBOL and Sergeotecmin to join forces in order to promote the mineral ressource of Bolivia
- A country with excellent mining opportunities within a wide range of commodities
- A modern cadastre system

GEUS

FINDINGS 2

- A national mining policy is not available
- Confusions with regard to the mining code
- Confusions with regard to the investment schemes
- Inadequate guidelines for how to apply for concession
- Inadequate websites – some even does not work

Promotion of the Bolivian minerals potential

GEUS

FINDINGS 3 – Mining Act no. 1777

Very liberal:

- Obligations and rights not well defined
- No reporting obligations
- No working obligations
- Only one type of license from exploration to mining
- No criteria for obtaining a license – except payment
- License period is unlimited

This type of mining code is not common any more!

GEUS

FINDINGS 4 – New constitution – new mining code

The State will be involved throughout from prospection, exploration, exploitation, metallurgical processes and marketing.

Private mining companies can enter into the mining sector, provided a contract has been established with COMIBOL.

Existing mining rights are respected – for one year

This type of mining code is not common any more!

Promotion of the Bolivian minerals potential

GEUS

FINDINGS 5 – The promotion efforts undertaken

- COMIBOL website – does not work
- Sergeotecmin website – difficult to find on the web
- Virtual library website – difficult to find on the web
- Geoinformation available, but limited – and not free
- Brochures/hand-outs made – but nobody knows it
- Most websites and brochures are in Spanish
- Competition among the institutions with regard to ownership of data and responsibility of the promotion

Promotion of the Bolivian minerals potential

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CONCLUSION

The availability of the following criteria is fundamental for a successful promotion of the mineral resources:

1. Geological potential
2. Modern mining act, regulations and mining cadastre
3. Security of the tenure
4. Political stability and stable fiscal regime
5. Easy acces to geological information
6. Promotion of the mineral potential

Promotion of the Bolivian minerals potential

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RECOMMENDATIONS 1

1. Development of one common internet portal – sourced by data from the all the government stakeholders – in English
2. Ensure availability of digital data – and preferably free of charge - in English if possible
3. Develop relevant brochures about the government stakeholders – in English
4. Develop relevant brochures for the mineral prospects which are regarded highly prospective

…. and

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RECOMMENDATIONS 2

1. Ensure a mining code system which balance the national responsibilities and still is competitive
2. Ensure transparency in all acts and regulations
3. Ensure a fair and transparent fiscal regime

Promotion of the Bolivian minerals potential

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FIRST STEPS TAKEN - Two project proposals

1. Adecuación normativa del sector minero metalúrgivo a la nueva constitución Política del Estado

2. Promocion del potencial minero de Bolivia (joint proposal from MMM, COMIBOL, and Sergeotecmin)

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ENRECA – Enhanced Research Capacities

Proposal:

Environmental control in gold deposits of cooperative mining in the Tipuani and Consata River Basins.

Proposed by:
Universidad Mayor de San Andres (UMSA)
Instituto De Investigaciones Geológicas Y Del Medio Ambiente (IGEMA)

ANNEX 7 Note on international mining code concepts

Based on Otto, 1996, UNCTAD publication. Edited by GEUS.

EXECUTIVE SUMMARY

Mineral policies evolve in response to geological resources, politics, economics and advancements in technology. The policy changes that take place are based on each country's unique combination of these and other internal and external factors. Trends can be identified for groupings of countries but the actual path of policy development and implementation varies widely from country to country. In some instances the policy may take the form of a stand-alone document but in many nations, an investor will need to interpret the policy from diverse sources of information. A published, stand-alone policy is a very useful regulatory tool that serves two important functions. First, it provides the mineral industry with a clear statement of the government's expectations and intent towards the industry. Secondly, it provides lawmakers and regulators with broad guidance.

Implementation of mineral sector policies is done through many agencies and administrative channels. An important part of the policy implementation framework is the body of laws that will statutorily affect the industry. Mining legislation takes the form of many different laws. In almost all instances, the mining code plays the central regulatory role but laws dealing with labour, safety, land, water, tax, foreign exchange, environment and so forth also enter into the picture.

Investment and government mining policy are closely linked. Even the most highly geologically prospective nations will have difficulty in attracting foreign investment without adequate national policy, regulatory and fiscal systems. Over the past few years the level of mineral sector investment has increased in real terms, and those nations that have put into place regulatory systems which reduce or allow a company to manage risks at an acceptable level have, for the most part, enjoyed increased levels of investor interest.

INTRODUCTION

It implies from the approval of the new Bolivian constitution that the Bolivian mining code and regulations are being revised. For inspiration of this work the authors find it relevant to provide the results of some investigations on mineral policy, legislation and regulation from a government perspective. The notes below are an edited version of J.M. Otto (1996): Mineral policy, legislation and regulation; published by UNCTAD. The notes here are not exhaustive or complete but indicate some of the essential aspect and trends in the international mining regulation systems, and points to some of the key issues for a successful development of the mining industry in Bolivia.

1. EVOLUTION OF NATIONAL MINERALS POLICY

Mineral policies evolve in response to geological resources, politics, economics and advancements in technology. The policy changes that take place are based on each country's unique combination of these and other internal and external factors. Trends can be identified for groupings of countries but the actual path of policy development and implementation varies.

1.1 European-developed economies

Historically, many European nations were large producers of a wide range of minerals. Sustained mining over the centuries depleted many known mineral deposits and locating new deposits has become increasingly difficult. With the exception of common construction minerals, most European nations are not perceived by exploration experts as highly prospective. While coal and base metals production has declined, the industrial mineral sector has prospered. There has been a trend to decentralize regulatory control, at least in part, of these industrial mineral operations to local government.

1.2 Major mineral-producing developed economies

The United States, Canada and Australia are all major mineral producing countries with good to excellent geological prospectively. Mining has been and continues to provide a substantial contribution to the economies. In the United States most minerals located on public lands are regulated under a mining code dating back to the late 1800s. Most non-safety and non-trade aspects of mine regulation in Australia and Canada are handled under State, territorial or provincial mining acts. For the countries an increasingly large amount of area is being closed to mineral claim staking. The largest of these land areas are places of significant natural beauty or areas that are particularly environmentally sensitive. There has been a clear trend over the past two decades to accord mining a lower land-use priority.

Environmental policies developed over the past two decades have led to the implementation of regulations, permitting procedures, and controls that impose significant costs on industry. Increased environmental awareness, questions about the rights of native peoples, the development of politically astute non-governmental organizations (NGOs) and increased community involvement have all acted to affect security of tenure. Today, the discovery of a deposit in these countries does not assure that the discoverer will be able to mine the discovery, even though such an assurance is given or inferred in the mining law.

1.3 Developing countries

Many developing countries were previously under the control of a colonial power or substantially within its field of influence. Many of the mines operating under colonial systems existed as virtual enclaves providing little benefit to the country, its economy and its people. With the coming of independence, many traditional colonial barriers to entry were lowered and the potential for increased foreign investment on a broad scale increased dramatically. Some nations embraced the concept of foreign investment and welcomed foreign involvement in their mineral sectors. However, most countries enacted new restrictions that precluded or acted to discourage foreign direct investment in mining. In most socialist developing nations, mining became a solely State-controlled and implemented activity. In many nations, policy positions on state sovereignty and control led to the creation of State mining enterprises (such as in Brazil, Chile, the Democratic Republic of the Congo and Zambia), to closure of the mineral sector to

outside investors, or to restrictions on the level of equity ownership that could be held by foreigners (e.g., India, Mexico, Philippines, Andean Pact nations). The result was that most free world mineral investment was centred in just three countries - Australia, Canada and the United States of America.

Over the past two decades there has been a dramatic change in the willingness of many developing and transition nations to accept major foreign investment in their mineral sectors. The reasons vary widely but include:

- lack of indigenous exploration and mining expertise and impediments to develop such expertise;
- inability of State enterprises to raise needed high-risk exploration and mining capital;
- declining ore reserves requiring fresh exploration efforts;
- limited access to foreign exchange and the fact that foreign exchange servicing of bank loans to State enterprises is generally higher than servicing transnational investment;
- declining or negative mine cash-flows requiring State subsidies or cash injections;
- an economy-wide move towards an expanded private sector;
- lack of access to new technology
- increased competition for State investment from more labour intensive sectors of the economy; and
- realization that the mineral endowment was not being developed at an optimal pace

The willingness to accept foreign investment prompted major policy shifts. Many developing nations have recently enacted modern mineral legislation or made major amendments to existing laws, entered into bilateral investment or tax treaties, and revamped geological surveys. An increased emphasis has been placed on government activities which actively promote investment.

2. MINERAL POLICY LEGISLATION

2.1 Role and importance of a national mineral policy

Every nation has a mineral policy. In some instances the policy may take the form of a stand-alone document but in many nations, an investor will need to interpret the policy from diverse sources of information.

A published, stand-alone policy is a very useful regulatory tool that serves two important functions: (i) It provides the mineral industry with a clear statement of the Government's expectations and intent towards the industry; and (2) it provides lawmakers and regulators with a broad guidance.

2.2 Objectives of minerals policy

Objectives of national mineral policies vary widely reflecting the unique circumstances of each nation. Countries with few mineral resources but requiring substantial mineral inputs will obviously emphasize different objectives than a mineral rich non-industrialized nation. Likewise, large mineral producers with substantial internal demand, have their own policy approaches.

While each nation's mineral policy is unique, it is possible to broadly categorize the types of topic common to many policies.

2.2.1 Policy scope

a) Types of mineral activity. The production of a mineral commodity involves a progression of several activities: exploration, mining, beneficiation or other primary treatment. A mineral activity policy should clearly state what stages of production are subject to the policy, i.e. exploration, mining beneficiation or other primary treatment.

b) Types of mineral. It is not uncommon to exclude some minerals from the general mineral policy. The most common mineral excluded is water, energy, and radioactive minerals. More rarely, industrial minerals such as sand, gravel, clay and dimension stone will also be handled separately. The mineral policy should clearly delineate which minerals are covered and which are not.

c) Relationship of mineral policy to other national policies. A national policy framework is composed of many policies, some of which are interlinked (mineral policy, water policy, labour policy, foreign exchange policy, balance of trade policy, environmental protection policy, etc.) While these policies should complement and supplement one another, it is inevitable that some discrepancies and conflicts will occur. To the extent possible, the mineral policy should state its relative relationship to other policies.

2.2.2 Sovereignty

a) Role of government in investment decision-making. In almost all countries, government plays a role in mineral-sector investment decision-making. Where the mineral activity is undertaken by the State, perhaps by a State enterprise, the role is direct. If the activity is by the private sector, the State still executes two types of important function: (i) The State lays down the regulatory and fiscal framework that will affect private sector investment, and thus directly or indirectly determines at least some investment climate factors. (ii) Without government acquiescence, in the form of granted licenses, leases, permits and concessions, investment cannot move forward.

b) Role of State enterprises. Exploration and mining are risky and competitive. The extent to which the government is directly involved with the exploration, mining and processing of minerals is a key part of a mineral policy and has been the subject of much debate. The rationale for direct State participation in the industry varies, ranging from the basic tenants of the underpinning economic system to more immediate objectives such as self-sufficiency, sovereignty, employment, and mobilization of capital. The trend over the past two decades has been a dramatic shift away from exploration and production by State enterprises. Many governments have instituted privatization policies, and have, or are now, transferring enterprise ownership to the private sector. While the overall trend has been to leave exploration and mining to the private sector, many exceptions exist.

The decision to move towards private ownership of mineral activities can be difficult to implement. State enterprises rarely have all the same objectives as a private enterprise. When these objectives change, the impacts on the local populous can be substantial. Operations may be closed, redundancies on a massive scale may result, and satellite enterprises such as schools, day-care, housing and factories may be affected.

c) Mineral ownership. Minerals belong to the State in most nations. Through various legal processes this ownership interest is passed to the private sector. It is important for a mineral policy to describe this process. In some nations mineral ownership passes at the time the mining authorization is issued, in others it passes at the time the mineral is extracted, or when taxes are paid on extracted minerals. Most large-scale mines are debt financed and the mineral ownership issue can affect lenders' decision-making. If the minerals do not belong to the mine at the time a loan is sought, then the mine cannot mortgage those minerals.

d) Foreign participation. The fundamental question with regard to foreign participation in the mineral sector is whether the government will allow it, and if so, will it be regulated the same or differently than mining by citizens. A mining policy should address these issues.

e) State equity requirement - a means to exert ownership and control. A mineral policy should clearly state whether the State will take an equity interest in a minerals operation and at what stage in the mineral development sequence it will acquire that interest. Nations that take an equity interest often do so for reasons related to an expression of sovereignty. By becoming an active or inactive partner in a project, the State can demonstrate that the national endowment, the nation's patrimony, is not exploited away by a foreign entity. The trend in the 1990s has been for States to not take an equity stake in mining ventures. If a government does require an equity share, the mineral policy should indicate what the upper level of that share is, whether the share will be taken at the exploration, development or mining stage, the nature of the equity interest, and how the interest will be valued. There are three main types of government-mandated equity: paid, carried interest, and free. There are many variations of these three approaches.
f) Local joint venture or other equity requirements. If a State does not require government participation in a project, it may still require a local ownership component. While this is not common worldwide, some nations seek to avoid criticism that the national mineral endowment has been given away to foreign entities. A mineral policy should describe any required local participation requirements. One of the obstacles in implementing a policy requiring a percentage of local equity is that it may be difficult or impossible for a foreign mining company to find a suitable, financially able partner. If the policy requires greater than 50 per cent local equity, most transnational mining companies will not invest.

2.2.3 Economics
a) Taxation types, levels and distribution. The mineral policy should identify the major forms of taxes payable by a mineral venture and describe, generally, the major types of incentives and deductions allowable for computing taxable income.
b) Export restrictions, costs, incentives. The nation's export policy should also be reflected in the mineral policy. In the past, many nations imposed various forms of export controls or levied taxes and fees on exported minerals. In order to promote downstream processing, higher export duties were levied on raw ores and concentrates than on metals or semi-manufactures. Since the 1990s, most of the export controls have been eliminated or considerably scaled back. Some governments still seeking to add value to minerals production through downstream processing have moved away from a penalty approach and now provide economic incentives to encourage companies to process locally.
c) Import restrictions, costs. The globalization of the world economy has also affected government restrictions and costs on imported minerals and goods used to produce minerals. Over the past decades import restrictions and costs have been effectively eliminated or reduced in many nations. Where import duties remain on capital equipment, it is now often possible to obtain some form of exemption from duties during a defined construction and development period. The mineral policy should lay out the nation's import policy as it affects mineral producers and importers.
d) Role in economic development. To the extent that a government requires a mine to aid in local development, the mineral policy should describe those requirements.
e) Employment requirements. The concept of "localization" also applies to mineral sector employment. Usually requirements to hire nationals or locals do not apply at the exploration stage but may be imposed on mines and downstream processing operations. The requirement may be levied directly by law or agreement, or can be implemented indirectly through work permitting procedures.
f) Conservation and efficiency. In most nations, minerals are the property of the State implying a duty of stewardship to see that the resources are developed efficiently. The extent, to which the government will intervene in mine production decision-making, if at all, should be identified in the policy. In most nations, the mine size, life and economic

ore cut-off grade are determined by the mine with no direct government intervention. However, the risk of high-grading can be largely avoided through government intervention. Countries that implement interventionist policies through the mining law usually do so through the use of approved mine plans or feasibility studies. The miner is required to submit a mine plan prior to being granted the right to mine, and that plan will propose the mine life, annual production schedule and cut-off grade which the state may accept or reject. The clear trend over the past decade has been for governments to take less of an interventionist approach, leaving production related decisions to the mine.
g) Land use. Exploration is a means by which to determine land use, and mining is a land use. Once mining commences on a piece of ground other economic uses for that land will cease or be precluded. Government policies dealing with economic land use issues are thus more oriented towards mining than towards exploration. Aside from environmental considerations, governments have two main concerns related to land use - revenues and compensation. Most governments tax land use. Compensation issues arise when a deposit is located in land that has an existing economic use which is incompatible with mining. The foremost issue for government is: which land use has highest priority? This should be clearly spelled out in the policy and reflected in the mining or land law. The means by which the level of compensation to be paid is determined, should be set out in the policy and implemented through provisions set out in the mining or land law.

2.2.4 Quality of life
a) Social impact. A mine can have a substantial social impact on local communities and people. Some impacts would be viewed as positive, some as negative, depending on one's point of view. For example, if the mine is located in an undeveloped, subsistence farming area, the economic linkages created through mine-paid wages and purchases may dramatically alter traditional value systems. One of the largest impacts that a mine can have on communities and people is the severing of economic and service ties when the mine closes. The clear policy trend today is towards a more regulated, planned approach to closure.
b) Environment. There are many issues relating to mining and the environment. From a policy perspective, environmental challenges result from three categories of mining operations - abandoned mines, existing mines and future mines. Each category may require separate regulatory approaches. Thus, policy questions arise as to what requirements can and should be levied on existing operations, and should these be different from those required of new operations.
Another policy challenge is to decide which government agency will be responsible for environmental enforcement. Attempts by many developing countries to enforce environmental laws through a Ministry of Environment have progressed only slowly due to a lack of adequate budget, manpower and training. Finally, will the government take a command and control approach linked to penalties in order to affect environmental policy, or will it offer economic incentives to encourage companies to act on their own?

2.2.5 Legislative framework
There are many legislative framework issues that can be included in a national mineral policy.
a) Applicable laws. The policy should describe the main laws that regulate the mineral sector, and discuss the general principles of determining which law will take precedence in case of a conflict of laws. Where both central government and provincial laws apply, it is also useful to identify and describe the relevant subject matters within the purview of different levels of government.
b) Exploration/mining rights regulatory approach. Most national mineral policies describe the basic approaches by which exploration and mining rights are awarded. The types and purposes of license, lease, concession and other authorizing documents are

described and reference is made to whatever law(s) regulate them. If there is a regulatory distinction between scales of operation, this should be described. Small scale mining rights should be dealt with by the policy. There has been a pronounced trend to recognize the valuable contributions, and dangers, that small-scale mining can make to local economies. Attempts to legitimize small-scale mining have produced mixed results.
c) Exploration and mining application priority. There are many regulatory systems used to award exploration and mining rights. A central policy question in the granting of such rights is the manner, in which priority is given to conflicting applications, i.e., where the area applied for by one applicant overlaps that applied for by another applicant. Systems based on bidding can resolve conflicting application situations. However, attempts to apply the technique to nonpetroleum mineral exploration and mining have largely proven unsuccessful.
d) Security of tenure. The term "security of tenure" relates to the stability of rights granted to implement different phases (exploration phase, development phase and the mining phase) of the mining sequence. Governments have an interest in seeing deposits developed quickly, efficiently, and once mining commences, in ensuring continuity of mining. Companies have an interest in timing start-up and maintaining operations according to market conditions and corporate restraints. The transition between the discovery of a deposit and the obtaining of mining rights is of major concern to companies (see table 1). Companies will hesitate to invest in costly exploration unless there is a reasonable assurance that if they discover a deposit, they will be able to mine it. Companies expect a reasonable level of government oversight and the need to first comply with legitimate government requirements before being granted the right to mine. The dilemma then for governments is if and how to time governmental approvals and impose time limits during the transition phase between exploration and mining. The policy should clearly state the government's position on the security of tenure during the transition from exploration to mining.

2.2.6 Regulatory agencies
a) Role of government agencies. Under most regulatory structures, the mineral sector will be regulated by a number of different government agencies. A mineral policy can assist investors by indicating the respective roles of the various relevant government agencies. Such roles usually exceed the regulatory role that focuses on implementation and enforcement of statutes. These other roles may include: *promotion of mineral-sector investment;* development of improved mining methods and technologies; exploration and resource/reserve delineation; provision of information; worker or community assistance; and liaison functions.
b) Information availability. A key component of many mineral policies is the treatment of information collection and dissemination. Issues that can be addressed in the policy include: the information role of government agencies; ownership of geological information; exploration reporting needs and requirements; mining reporting needs and requirements; confidentiality and accessibility of information submitted by a company to the government.

3. FORM AND CONTENT OF MINING LEGISLATION

Implementation of mineral-sector policies is done through many agencies and administrative channels. An important part of the policy implementation framework is the body of
laws that will statutorily affect the industry. Mining legislation takes the form of many different

laws. In almost all instances, the mining code plays the central regulatory role but laws dealing
with labour, safety, land, water, tax, foreign exchange, environment and so forth also enter into
the picture.

Three typical approaches to the central mining law framework apply: (1) Exploration and mining rights derive from an authorization granted in a licence, lease or concession granted under a law of general application specifying uniform rights and obligations for each class of mineral tenement; (2) Terms are set out in a model agreement which supplements or supersedes the general mining law; or (3) terms are negotiated in an ad hoc agreement which may either supersede or supplement the general mining law. Many different approaches have been developed under these and other basic legal frameworks. Another important policy implementation tool is administrative practice and procedure.

3.1 General mining law

The general mining law, and to a lesser extent mining agreements, play the central role in government regulation of the mineral sector. Mines, regardless of where they are located, generate similar types of challenges for governments and therefore there is similarity in the content of such laws.

***Table 1**: Regulatory risk questions mining companies ask relating to regulatory matters outside the mining law*.

Does the country have a mineral policy?
Has the Government's approach to the regulation of investment in the mining sector been consistent and predictable?
Are there any restrictions on the ability to repatriate profits?
Are there realistic foreign-exchange regulations?
Is it legal for the company to maintain external accounts?
Is it possible to pre-determine the types and levels of taxes on mining?
How stable is the fiscal regime?
Are there any duties, restrictions or requirements regarding the importation of equipment?
Are there any export duties, restrictions or requirements which will affect the ability of the mine to sell into the international market?
Is it possible to predetermine to what extent a mining company will have environmental obligations?
Will the level of obligations change in the near future?
Can an ad hoc mining agreement be used to supplement or supersede the general mining law?
Are there factors unique to the country which will hinder the ability of the company to raise financing from lenders?
Are there any restrictions which will make it difficult to apply geological assessment techniques such as airborne surveys?
What special restrictions apply to foreign investment in the mining sector?
Does the law allow the company to maintain a majority equity ownership position?
Are foreign companies allowed to maintain management control?

Is the linkage between the mining code and the general laws governing land well established?

Are other relevant legislation and administrative structures well integrated and workable?

Are there any restrictions on hiring and firing staff and on setting their level of wages?

Are there any restrictions on bringing in expatriate specialists?

***Table 2**: Regulatory risk questions mining companies ask relating to regulatory matters commonly addressed by the mining law, with regard to the exploration period*.

Application	Are application procedures clear?
	Who may obtain an exploration right?
	How long does it take to obtain approval/disapproval?
	Can a company determine what areas are open for exploration?
	Is exploration a priority land use?
	Are geological and historic mining records open for inspection?
	Are records filed in a systematic, useful manner?
	Does the first applicant for an area have priority?
	Is the approval authority clearly defined?
	Does the approval authority have sufficient authority to grant an effective exploration right?
	Is there an established and accessible mineral titles system?
Size of area	Are there limitation on the maximum size for which exploration rights can be granted?
	Does the size of area allowed make sense given today's exploration technology?
	Must areas be progressively relinquished?
Duration	Is the duration of the exploration right suitable for the area?
	Is the right renewable? If so, is renewal automatic or discretionary?
Reporting requirements	Are reporting requirements reasonable?
	What assurances are there that the report will be kept confidential during the exploration period?
Obligations	Are the obligation of the holder of the exploration right clearly defined?
	Are obligations reasonable?
	Is a performance bond required?
	Is a work-plan required? If so, who is the approving authority? Is there a means for resolving a dispute?
Rights	What rights does a right of exploration confer?
	Are the rights exclusive within the exploration area? Can others be granted exploration rights over the same or an overlapping area?

	Are exploration rights restricted to a single mineral or do they apply to all minerals?
	Does the right extend to all types of land within the exploration area?
Transferable	Is the exploration right transferable? If so, what restrictions apply?
	Are transfer procedures clear and practical?
	Cancellation and suspension?
	Under what circumstances can the exploration right be cancelled or suspended? Who may cancel and exploration right?
	Is there and appeal process?

***Table 3**: Regulatory risk questions mining companies ask relating to regulatory matters commonly addressed by the mining law, with regard to the transition period*.

Who has legal ownership of minerals in the land?
Who may obtain a mining right?
At what point may an exploration right be converted to a mining right?
Is the right to apply for a mining right guaranteed at the exploration stage?
Is mining a priority land use?
Are the application procedures clear?
Is it clear who has the authority to grant a mining right? Are there any limits on discretionary approval authority?
Is a feasibility study required? Must the Government approve it?
Is an environmental impact assessment study required?
How long time does it take to obtain approval/disapproval?
Is there an avenue for appeal should the mining right not be granted?
Does the mining legislation supersede other legislation such as land law?
Are there clear procedures to resolve land use conflict?
What requirements must be met before mining may proceed?

***Table 4**: Regulatory risk questions mining companies ask relating to regulatory matters commonly addressed by the mining law, with regard to the development period*.

What regulatory requirement may delay construction?
Are permits required from multiple agencies?
Are import duties reasonable on mine equipment?
To what extent is local sourcing required?
How long a period is allowed for development?
To what extent can the government control the technical design of the mine?

***Table 5**: Regulatory risk questions mining companies ask relating to regulatory matters commonly addressed by the mining law, with regard to the mining period*.

Size of area	How is the size of the mine area determined?
	Is there adequate protection to accommodate for all necessary mine workings, tailings areas and dumps?
Duration	Is the duration of the mining right suitable for the deposit?
	Is the right renewable? If so, is renewal automatic or discretionary?
Reporting requirements	Are reporting requirements reasonable?
	What assurances are there that submitted reports will be kept confidential during the mining period?
Obligations	Are the obligations of the holder of the mining right clearly defined?
	Are the obligations reasonable?
	Is a performance bond required?
	Is a production plan required? If so, who is the approving body? Is there a means for resolving a dispute?
	Are there training requirements for nationals?
	Are all taxes easily identifiable?
	Are all taxes reasonable?
	Are all taxes non-discriminatory?
	Are all taxes stable?
	How are tax disputes resolved
	What environmental protection criteria must be met?
	What liability may be incurred by the company or its directors with regard to environmental requirements?
Rights	What specific rights does a right of mining confer?
	Are the rights exclusive within the mining area? Can others be granted rights, perhaps for another mineral, over the same or an overlapping area?
	Are mining rights restricted to a single mineral or do they apply to all minerals?
	Does the right include the right to use water, sand and gravel, and timber in the mining area for the purposes of mining?
	Are there any restrictions which will impede the sale of the mine product to the best paying customer?
	Are there any restrictions on the use of specialist expatriate staff?
	Are employment requirements reasonable?
	Can the holder of the mining right have management control of the operation?
	Do rights under the mining law supersede those of others granted under other laws?
	Are rights granted under the mining law subject to any restric-

	tions arising out of other laws?
Transferable	Is the mining right transferable? If so, what restrictions apply?
	Are transfer procedures clear and practical?
Cancellation and suspension	Under what circumstances can the mining right be cancelled or suspended?
	Who may cancel a mining right?
	Is there an appeal process?

***Table 6**: Regulatory risk questions mining companies ask relating to regulatory matters commonly addressed by the mining law, with regard to the reclamation period*.

Are there any requirements for reclamation? Are they reasonable?
Is a reclamation bond or similar instrument required?
Are requirements stable or will they increase in the near future?

***Table 7**: Regulatory risk questions mining companies ask relating to regulatory matters commonly addressed by the mining law, with regard to dispute resolution*.

Are procedures to resolve disputes between the government and the investor clearly identified?
Is dispute resolution impartial? Is arbitration available?

3.2 Role of rules, regulations and administrative orders

Many mining codes are supplemented with mining regulations, rules, administrative orders, administrative guidelines and other regulatory devices. Depending on the legal system, such regulations, rules and administrative orders may derive directly from a power granted in the mining law to a specific government officer, or may derive from the general principles of administrative law. Typically, the Minister for Mines, or his legal equivalent, is granted the authority to issue regulations/rules/orders.

The fact that such regulations are not passed as laws by the law-making body, implies that there is a great deal more flexibility in when and how they come into being and how and when they are modified. This latter point is important with regard to the subject matter contained in the mining law. Regulations can often be changed very quickly and with limited political input. Thus, lawmakers are wise to consider which subject matter should be in the mining law and which topics are better placed in regulations. Since laws are more difficult to change than are regulations, the subject matters addressed in the law are usually considered as more stable than those found in the regulations.

3.3 Ad hoc and model mineral development agreements

Mining agreements are not the usual way governments regulate mines. Even in nations where governments utilize mineral agreements, their use is usually restricted to very large projects, where the governments use agreements to help regulate large mines but handle smaller operations under specific provisions in the general mining code. In many instances, even when an agreement is in place, some, or all, of the mining code may still apply to the operation.

4 POLICY, REGULATION AND INVESTMENT

There is a close relationship between mining policy, regulation and investment. Mining companies have many options to choose from when deciding where to invest. Companies balance many factors when deciding where to invest. Geological potential is usually a high priority but even excellent geology may not be enough to attract investment if the policy and regulatory framework are thought to be inappropriate or unworkable.

In a survey of 39 transnational mining companies conducted for the United Nations (Otto,
1992a,b) a ranking was made of 60 investment criteria used by transnational mining companies when deciding where to invest. Of the top ranked 20 criteria, all but 10 per cent were
related in some way to government policies and regulatory systems (see table 8). Thus,
governments have a great deal of control over their mineral sector investment environment.

Table 8: *Ranking of investment decision factors at the exploration and mining investment stage. Data derived from a survey of 39 transnational mining companies (Otto, 1992). It is the view of the authors that conclusions of this old survey is still valid.*

Exploration stage	Mining stage	Decision criteria
1	Na	Geological potential for target mineral
Na	3	Measure of profitability
2	1	Security of tenure
3	2	Ability to repatriate profits
4	9	Consistency and constancy of mineral policies
5	7	Company has management control
6	11	Mineral ownership
7	6	Realistic foreign-exchange regulations
8	4	Stability of exploration /mining terms
9	5	Ability to pre-determine tax liability
10	8	Ability to predetermine environmental obligations
11	10	Stability of fiscal regime
12	12	Ability to raise external financing
13	16	Long-term national stability
14	17	Established mineral titles system
15	Na	Ability to apply geological assessment techniques
16	13	Method and level of tax levies
17	15	Import-export policies
18	18	Majority equity ownership held by company
19	21	Right to transfer ownership

20	20	Internal (armed) conflicts
21	14	Permitted external accounts
22	19	Modern mineral legislation

5. CONCLUSIONS

During the past two decades a shift has taking place in mining policies: (1) Increasing levels of regulation are being imposed on the major mineral-producing developed nations; and (2) increasingly attractive policies are being introduced in developed nations. These policy changes may account for investment booms in the mining sector seen over the past twenty years, and in particular in some of the Latin American countries, due to introduction of accommodating policy, fiscal and regulatory systems.

Those nations with good geology and attractive policies and regulatory systems are best positioned to withstand any downturn in the mineral sector due to glo

ANNEX 8 ENRECA project proposal by UMSA/GEMA

1. INSTITUCION POSTULANTE

Universidad Mayor de San Andrés (UMSA)
Facultad de Ciencias Geológicas
Carrera de Ingeniería Geológica
Instituto de Investigaciones Geológicas y del Medio Ambiente (IGEMA)

Director: Dr. Jaime Argollo Bautista (E-mail Jaime_argollo@yahoo.es)
Dirección : Calle 27- Pabellón 3 - Campus Universitario- Cota Cota La Paz – Bolivia
Telf.: 2793392 – fax 2793124 casilla 35140
Coordinador: Ing. Germán Núñez Aramayo (E-mail.: gernuara @mixmail.com)
Participante: Ing. Marco A. Guzman

Organización:

Administración Financiera:

Los fondos para apoyar las actividades del Instituto provienen de dos fuentes principales:

Presupuesto Universitario e Ingresos Propios generados por la prestación de servicios a externos.

La primera fuente de ingresos se refiere al pago de docentes investigadores, servicios básicos como energía, agua y principalmente y un presupuesto mínimo anual del Instituto, controlado por el Departamento de Administración Financiera de la UMSA.

Los ingresos propios generados por prestación de servicios forman parte del presupuesto del Instituto y es controlado por la oficina del Área Desconcentrada de la Facultad.

El uso de los fondos del Instituto se realiza mediante un Supervisor Administrativo que ejecuta en coordinación con la Oficina de Facultad.

El presupuesto es preparado al final de cada año, basado en los requerimientos de los proyectos de investigación aprobados.

Políticas y Estrategias de Investigación:

Titulo del Proyecto: CONTROL AMBIENTAL EN LOS DEPOSITOS DE ORO DE LA MINERIA COOPERATIVISADA DE LAS CUENCAS DE TIPUANI Y CONSATA

El presente proyecto se basa en los siguientes estudios: metodologías de la exploración, de beneficio de tecnologías limpias y control Ambiental. Con el objetivo de incrementar la recuperación de oro de los yacimientos auríferos de las cuencas del río Tipuani y Conzata (Norte del Departamento de La Paz), de modo que, se establecerán tecnologías limpias bajo costo, que permitan un mejor desarrollo y control de la explotación aurífera de estos distritos.

Determinar fuentes de contaminación y establecer medidas de mitigación con el propósito de recomendar su aplicación en las cooperativas auríferas del sector.

Desarrollar talleres (Charlas, seminarios, conferencias, etc) de tipo técnico y social orientados a mejorar sus procedimientos de explotación y beneficio considerando los aspectos ambientales bajo normas establecidas.

Identificación del Problema:

La Provincia Larecaja del departamento de La Paz se caracteriza por su ocurrencia en oro primario y aluvial. Su actividad principal es la explotación y beneficio del oro. En la actualidad en esta región existen 131 Cooperativas Auríferas afiliadas a la Federación Regional de Cooperativas (FERRECO), con aproximadamente 6.550 asociados directos y 32.750 entre familiares y otros.

En la labor de explotación y beneficio se utilizan técnicas rudimentarias para la recuperación de oro, esta actividad si bien reporta algunas utilidades, exige un trabajo sacrificado de parte incluso de toda la familia en el aspecto técnico y principalmente

en lo concerniente a la política ambiental no es apropiada, mas al contrario, se caracteriza por ser contaminadora y degradadora del Medio Ambiente, ocasionando significativos impactos ambientales negativos, debido a los siguientes aspectos principales:
Explotación y procesamiento rudimentarios
Uso indiscriminado de mercurio (efusiones hacia al río y al aire)
Turbidez de los ríos
Descarte de desechos mineros sólidos
Destrucción de paisajes debido a la explotación minera
En el pasado han existido empresas y/o organizaciones no gubernamentales que han tratado de prestar la colaboración necesaria para desarrollar un trabajo sistemático acorde con las reglamentaciones vigentes, como es el caso de MEDM1N (Cooperación Suiza) que no ha podido efectivizar una cooperación adecuada. Por otro lado la Empresa South American Placers Inc. (SAPI) en 25 años realizó una explotación irracional con el oro depositado en el lecho del rioTipuani[2]. Por lo anterior se puede concluir que este sector es una región del Departamento de La paz totalmente olvidada sin ningún asesoramiento técnico ni social. La Universidad Mayor de San Andres tampoco ha podido asistir este sector tan deprimido excepto el año 1997 se dictaron algunos curso del preuniversitario a través del Instituto de Desarrollo Regional IDR.
Por lo anterior el Instituto de Investigaciones el Instituto de Investigaciones Geológicas y del medio Ambiente (IGEMA) consientes de esta problemática a través de la presente propuesta pretenden asistir esta región con aspectos técnicos, sociales y control ambiental, para beneficio del sector, obviamente con la cooperación de ENRECA
Justificación:
El Instituto de Investigaciones Geológicas y del Medio Ambiente en sus políticas de Investigación actualmente identifican como una de sus prioridades en áreas de investigación la exploración, y contaminación del medio ambiente producto de la explotación del oro, mejorando e incrementando la producción minera de las Cooperativas auríferas de la región. Desarrollando tecnología de reducción de la contaminación, asesoramiento, verificación e introducción de normas técnicas.
Impactos:
Mejora de las condiciones socioeconómicas de la población asentada en la región, estimada en 70.000 habitantes aproximadamente, comprendidas entre las poblaciones de Tipuani, Conzata, Guanay, Challana y otras poblaciones menores.
Las Cooperativas mineras auríferas en producción contarán con el apoyo principalmente en aspectos de capacitación y asesoramiento.
La población relacionada indirectamente a las Cooperativas mineras contara con conferencias y exposiciones sobre problemas de contaminación y su efecto en la salud.
Los Municipios de Guanay, Tipuani y otros podrán disponer la información y asesoramiento para la elaboración de proyectos y/o programas con el propósito de mejorar la explotación racional de estos recursos no renovable.
En la medida que las cooperativas mineras vayan implementando las recomendaciones técnicas, la generación de fuentes de empleo es alentadora.
Incremento de la producción aurífera debido a la implementación de tecnologías limpias de exploración, explotación y beneficio.
Objetivo:
Reducir en forma integral los problemas Ambientales generados por la actividad minero metalúrgica aurífera en el sector de la minería chica y Cooperativizada en la cuenca de los ríos Tipuani – Conzata
Actividades:
Establecer las características geológicas y mineralógicas de los yacimientos.

Determinar fuentes de contaminación (agua, suelo y sedimentos).
Recomendar y/o establecer formas de mitigación de contaminación minera.
Evaluar el contenido de mercurio de los afluentes (muestras liquidas, sólidas y orgánicas).
Generar procedimientos metalúrgicos para el procesamiento de minerales a partir de tecnologías limpias. (Bio lixiviación y otras)
Analizar alternativas tecnológicas para su implementación en plantas de procesamiento gravimétrico.
Principios teoricos:
Geología y Minería
Los distritos auríferos de Tipuani y Conzata se encuentran en la faja sub andina. En estos yacimientos el oro yace en su parte superior en depósitos primarios y en su parte baja en depósitos secundarios dentro del conglomerado cangallí.
En las zonas elevadas, los batolitos son esencialmente las principales rocas minero-genéticas de la mayor parte de los minerales de Bolivia. Parte de estas rocas son auríferas, dentro de gangas cuarzosas, encontrándose el oro asociados a minerales formados a bajas temperaturas. Suele considerarse que tales vetas constituyen el yacimiento original del oro.
La separación del oro de las vetas cuarzo-auríferas tuvo lugar por un proceso de meteorización mecánica, siendo transportados por los ventisqueros, arroyos, ríos y mazamorras hacia los valles, juntamente con el material estéril, para ser depositados posteriormente en el conglomerado Cangalli.
Los métodos de concentración mas importantes son:
Concentración por gravimetría
La concentración de oro en placeres auríferos se realiza utilizando en primera instancia un clasificador "grizzli", con objeto de eliminar el material de mayor tamaño. El aluvión es previamente deslamado y lavado con chorros de agua a presión sobre el grizzli. Con el caudal de agua, el material clasificado es arrastrado hacia las canaletas provistas con perfiles de hierro en forma de "L", los cuales retienen el oro grueso en mayor proporción y fino en menor escala conjuntamente otros minerales pesados en forma de arenas negras.
Recuperación de oro por amalgamación
La amalgamación es un proceso de concentración gravimétrica en el cual el oro es separado de los minerales metálicos que forman la ganga, en razón de su mojabilidad selectiva de la superficie del metal por mercurio en medio acuoso. La amalgamación se realiza en bateas (cimas), turriles, tambores, canaletas, trapiches, placas (planchas) y mesas vibrantes. En la operación se obtiene una pella (combinación oro - mercurio), que luego es separado por destilación.
La recuperación de oro por amalgamación es alrededor del 90 % para las partículas gruesas, en cambio para partículas finas (menores a 65 mallas de la serie Tyler) la recuperación disminuye considerablemente entre el 30 % y el 50 % como máximo.
Contaminación por mercurio es debido a:
Falta de cuidado en su manipuleo (perdidas mecánicas).
" Formación de harina de mercurio por molienda fina directa y por contenido de sulfuros en la mena.
Por destilación de mercurio en forma directa en vasijas abiertas o por el mal manejo de equipos (retorta).
Por evaporación a temperatura ambiente.
Por tratamientos químicos (formación de sulfato de mercurio).
El vapor de mercurio influye perjudicialmente en la salud de las personas produciendo secreción abundante de saliva, enflaquecimiento, debilidad, temblores, tartamudez, parálisis, intensos trastornos en la actividad mental, pérdida de control en la actividad muscular y muerte en los casos más críticos.

El efecto de contaminación también se presenta en los ríos y consiguientemente en los peces, que al ser uno de los alimentos del hombre tiene relación directa con el proceso cíclico, mercurio - pez - hombre que se atribuye a los iones de $Hg^{z}+$ y a las combinaciones como el metíl mercurio (CH_3Hg+), etc. De igual manera influye sobre las plantas ejerciendo una acción destructora.
Hipótesis:
El estudio y control de las fuentes de contaminación seguida de la implementación sistemática de tecnologías limpias en la recuperación de oro en las cuencas del río Tipuani y Conzata permitirán desarrollar esta labor de explotación de oro bajo normas establecidas en la Política Ambiental del País.
Tareas de investigación:
El proyecto se desarrollarse en una fase de tres etapas:
Primera etapa: En esta fase se realizará la identificación, clasificación y evaluación del grado de contaminación por mercurio, turbidez y descarte de desechos sólidos mineros de acuerdo a los pasos que a continuación se consignan:
En la zona se procederá a la identificación e inventariación de las cooperativas en actual operación.
En las cooperativas seleccionados se realizaran los trabajos de exploración y prospección minera. Así como se identificaran y definirán los puntos de toma de muestra en función de la deposición de los materiales de descarte y de acuerdo a normas establecidas.
En los puntos identificados, se realizaran los siguientes trabajos:
Toma de muestras sólidas y líquidas
Cuantificación del porcentaje de sólidos
Medición del grado de acidez
Medición de la conductividad
Medición de turbidez
Calidad de agua
Contaminación en peces, fauna, flora, etc.
Preparación y envío de muestras para sus análisis a laboratorios del Instituto y otros laboratorios.
Interpretación de resultados
Preparación de informes periódicos y final.
Segunda etapa: En esta fase se desarrollaran talleres (Charlas, seminarios, conferencias, etc) de asesoramiento y adiestramiento respecto a la siguiente temática:
Procedimientos de uso apropiado de maquinarias y equipos para el beneficio de minerales
Problemática que ocasiona el mal uso de mercurio
Metodología recomendada para el uso apropiado de mercurio
Técnicas modernas para la recuperación de valores finos que reemplazan el uso de mercurio
Tercera etapa: Con los aspectos identificados y evaluados en las anteriores fases, la implementación de tecnologías limpias es necesaria para propósitos de mitigación de la contaminación ambiental ocasionado tanto por la inapropiada tecnología empleada o por el uso de mercurio

2. INSTITUCION POSTULANTE

Universidad Mayor de San Andrés (UMSA)
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Telf.: 2793392 – fax 2793124 casilla 35140
Titulo del Proyecto: CONTAMINACION MINERA DEL LAGO TITICACA

La Subcuenca del Lago Titicaca presenta limitados impactos de actividades mineras (DAM-Matilde). Predominan los impactos de otras actividades (industrias Perú, turismo).
Entre las actividades en curso se tienen plantas de tratamiento biológico de aguas servidas y el Plan de Gestión Ambiental Binacional (Perú-Bolivia).
La propuesta es implementar un proyecto de mitigación de los impactos del DAM en mina Matilde y minas aledañas junto a la contaminación del rio Katari al sur.

ANNEX 9 Project proposal: Enhancing environmental quality through improved gold recovery in artisanal and small-scale gold mines in Bolivia

Background
Artisanal and small-scale mining for gold is practiced in many parts of the world. In 1999 the International Labour Organization (ILO) estimated that about 13 million people were directly engaged in artisanal and small-scale mining (ASM) activities in developing countries, with excess of 100 million people directly or indirectly dependent on them for their livelihoods or subsistence. ASM activities are mostly carried out by groups of people mostly unaware of the associated environmental and related health risks.

ASM encompasses informal, legal and illegal miners who use inadequate mining and beneficiation techniques, primitive ore treatment processes only recovering 30-60% of the gold contained in the ore. Through ASM activities the natural environment is severely degraded. One obvious environmental problem is deforestation of vast areas, where the wood is used for processes related to ASM. Tunnelling and digging of numerous pits in unconsolidated river sediment releases large amounts of fine-grained material, which tend to clog up the rivers and increase the risk of flooding.

Small-scale gold mining is conducted by people working with simple tools and equipment, usually in the informal sector, outside the legal and regulatory framework.

In Bolivia small-scale gold mining prevails in the Amazon part of the country. Tens of thousands of miners extract gold with serious environmental implications. The most serious environmental hazard is caused by the extensive use of mercury in the extraction of gold (amalgamation). Amalgamation, which has been used by ASM for centuries, causes obvious, long lasting environmental and health problems.

About twenty years ago ASM in parts of the Philippines invented the so-called borax method, and it is still widely used every day by thousands of ASM in that country. Last year an EU financed project in Ghana proved that the borax methodology was applicable in Ghana as well.

The borax gold extraction is a fairly simple non-toxic method which requires a minimum of technical expertise. GEUS is presently engaged in a project introducing borax among ASM in Tanzania. For inspirational purposes, the following sections give a brief account of this project.

1. *Overall Objectives*
The overall objective of the project is:

> *As a integrated part of National Strategy for Growth and Reduction of Poverty (NSGRP) to increase living conditions in rural areas especially for small-scale miners*

Notwithstanding the negative environmental and health effects, significant economic benefits to be reaped from ASM activities have recently been recognized by several Asian and African countries at World Bank organised small-scale mining conferences in Manila, Philippines, 2005, in Antsirabe, Madagascar, 2006 and in Brasilia 2008. In-

deed, the potential of the sector to contribute significantly to socio-economic development is great. Such contributions include the decisive role it can play in:

- Poverty alleviation, especially in rural areas
- Reducing rural-urban migration, especially for the unemployed youth
- Addressing gender issues
- Maintaining the vital link between people and the land
- Addressing the issue of child labour
- Creating alternative economic activities
- Contributing to national income; and
- Contribute to national revenues

2. *Immediate Objectives*

The main aim of this project is to assess the degree of environmental degradation caused by disorganized ASM activities for gold mine areas in Bolivia. Moreover the study will investigate the geological, mineralogical and geochemical characteristics of gold ores in different ASM for gold areas focusing on identifying ways of improving gold recovery by alternative method or minimization of mercury usage.

The specific objectives for this project are:

- Inventory of the real situation (number of miners per area, environmental degradation status, etc.) of the ASM for selected gold areas

- To document best mine practices in ASM activities with the aim of disseminating among the artisanal and small-scale miners.

- To develop best available techniques (BAT) for artisanal/small-scale miners and demonstrate that the suggested techniques for their particular gold ores will increase recovery of gold significantly and enhance environmental quality.

3. *Research Questions*

With respect to the above objectives, the following questions will guide this research.

1. What is the environmental degradation status of the ASM activities in the study areas?

2. What are the major environmental impacts associated with ASM activities in the study area?

3. What are the gold extraction techniques used by artisanal/small-scale miners? How well do they perform?

4. What potential is there for strengthening existing extraction techniques?

4. Methodology

Field and laboratory investigations will be conducted in order to answer the above questions.

4.1 Field investigations

Field investigations will be conducted in selected ASM areas. Field investigations will comprise geological mapping and collection of gold ore. The field investigations will

also include detailed investigation of the presently used gold extraction techniques and collection of samples from all steps of gold extraction as well as the tailings (rejects).

4.2 Laboratory investigations
Laboratory investigations will include analyses of gold in gold ores and in all samples from the different steps of gold extraction. The raw gold ores and other samples will be analyzed mineralogical in order to unravel the grain size of the gold and to what extent the gold is locked up in other minerals.
The borax method will be tested on a number of gold concentrates from different locations.

5. Project activities

The main activities to be carried out by the consultants will include:

- To assess the degree of environmental degradation caused by disorganized ASM activities for selected gold mine areas in Bolivia.

- To conduct geological mapping and collection of gold ore.

- Detail investigation of the presently used gold extraction techniques and collection of samples from all steps of gold extraction as well as the tailings (rejects).

- To conduct laboratory investigations and analyses of gold in gold ores and in all samples from the different steps of gold extraction. The raw gold ores and other samples will be analyzed mineralogical in order to unravel the grain size of the gold and to what extent the gold is locked up in other minerals.

- To develop best available techniques (BAT) for the particular gold ores in question. When BAT of the chosen gold mining district(s) has been found the methods will be tested in the field in close cooperation with the local ASM. The artisanal and small-scale miners in the chosen districts will then be introduced to the BAT for their particular ore body.

ANNEX 10 Project proposal: Promotion of the mining potential of Bolivia

BACKGROUND

The Ministry of Mining, Comibol and Sergeotecmin are institutions of the Bolivian State; each one of them is in charge of developing activities within the framework of the National Development Plan (PND, Spanish acronym) to support the mining development in the different areas. Each one of these institutions has produced basic information, as per their Annual Operating Plans, with the objective of bringing investments into the country, and thus comply with the pillar of improving the quality of life of the Bolivian people and therefore the "live well" concept for the inhabitants of mining areas.

The information generated has been published in different means (paper and digital), and lately, with the support of International Projects, much of the information generated has been standardized, for example Sergeotecmin has available: the Environmental Information System, with the objective of disseminating environmental information by sectors; the Virtual Library, to disseminate all of Sergeotecmin's bibliographic material; the Geosemantics System, for the purpose of sharing information about natural risks; and other systems currently being implemented, all of them with a specific purpose.

Within this framework, different technical reports have been published, such as the Metallogenic Map, the Geologic Map, the Map of Prospecting Areas, the Thematic Map in a scale of 1:250.000 and 1:100.000; etc.

On the other hand, the Ministry of Mining and Metallurgy has established a system to register and monitor the commercialization of minerals, by the name of SINACOM. Likewise, this system has statistical information on mineral listings and production.

Each of these entities has independent web pages so as to provide information regarding their objectives and services, these pages are connected through links, and provide information by sector. However, there is no main domain for *mining promotion* that allows potential investors' access to basic information to learn about the country's mining potential.

GENERAL OBJECTIVE

Promote Bolivia's mining potential using state-of-the-art technology.

SPECIFIC OBJECTIVES

Attract investment capitals in the area of mining and other areas related to natural resources.

Transfer technology, knowledge and experience about current Information Technology (IT).

Joint development of systems, applications and others to allow the implementation of the Mining Promotion Information System.

Financial assistance to implement a data center under international regulations and standards.

Financial cooperation for the implementation of the necessary hardware, software and communications systems.

ACTIVITIES

OBJECTIVE 1	ACTIVITIES
Transfer technology, knowledge and experience about current Information Technology.	Training in the area of Information Technology for the implementation of systems

OBJECTIVE 2	ACTIVITIES
Joint development of systems, applications and others to allow the implementation of the Mining Promotion Information System.	Collection and classification of information. Design of the new Information System. Development of applications and implementation of the Mining Promotion Information System. Launching.

OBJECTIVE 3	ACTIVITIES
Financial cooperation for the implementation of a data center under international regulations and standards.	Implementation of a data center under international regulations and standards.

OBJECTIVE 4	ACTIVITIES
Financial cooperation for the implementation of the necessary hardware, software and communications systems.	Acquisition of computer equipment (hardware and software).

ESTIMATED BUDGET

	DESCRIPTION	AMOUNT
1	Non-Personnel Services (National Consultants)	288.000
2	Training (Travel, Per Diem and others)	785.000
3	Data Center (Rack, patch panels, wiring, physical security installations)	1.500.000
4	Computer equipment and peripherals	200.000
5	Software licenses	250.000
		3.023.000

La Paz, Thursday, January 29, 2009

ANNEX 11 Project proposal: Adaptation of the metallurgical mining sector normative to the new politial constitution of the state

I. BACKGROUND

- The role of the State in the development of metallurgical mining during the 20 years the neoliberal model was in force was reduced to the administration of Shared Risk contracts, abandoning productive work.

- The **PND DS** 29172 of September, 2007, as part of the proposal for change, is inserted into the metallurgical mining sector, establishing that the aim of the **"*Productive Bolivia*"** strategy is transformation, integrated change and the diversification of the productive matrix, generating excedents, income and dignified employment.

- The sectorial policies and strategies to be implemented in the framework of the **PND** are as follows:

    1. A new juridical-normative framework for integral mining development
    2. State participation as protagonist and promoter of Mining and Metallurgical Development
    3. Development and Diversification of Metallurgical Mining Potential in the country
    4. Strengthening Small and Cooperative Mining
    5. Community Participation

Point 1, related to the implementation of the present proposal, establishes the following sectorial priorities:

1. Register, control and supervise mining operators and their activities throughout the productive circuit.
2. Administrate mining concessions through the creation of a specialised service organism, so that they are exploited and not retained unproductively.
3. Implement a tax system which allows the State to obtain greater income without affecting the viability of present and future investments.
4. Register and control mineral commercialization activities so that they are carried out transparently, in benefit of the producers and the State **(SENARECOM).**
5. Elaborate norms and procedures to regulate mining activity and the new roles of State institutions in the mining sector.

6. Implement the programme to reform the legal framework with efficient vision and transparency, framed in the strategy to modify the regulatory, productive juridical framework of the mining sector.

II. OBJETIVO GENERAL

Develop metallurgical mining in the framework of the **PND – PSDMM**, through the elaboration and implementation of a New Mining Law.

III. SPECIFIC OBJECTIVES

- Proposals for normative modifications to be incorporated into the New Mining Law systematised and revised.

- New Mining Law contributes to sectorial development in the framework of the **PND – PSDMM.**

- Fulfillment of sectorial objectives and national strategies through the diffusion and implementation of the New Mining Law.

IV. ACTIVITIES

OBJECTIVE 1	ACTIVITIES
Proposals for normative modification to be incorporated into the New Mining Law systematised and revised.	Systematisation and arrangement of existing proposals
	Elaboration of the proposal for the New Mining Law based on contributions of the different sectors.
	Revision and presentation of the proposal to the competent authorities for approval.

OBJECTIVE 2	ACTIVITIES
New Mining Law contributes to sectorial development in the framework of the **PND – PSDMM.**	Procedures for approval and enactment of the New Mining Law before the competent authorities
	Design and edition of the New Mining Law
	Elaboration of didactic material on the New Mining Law for diffusion

OBJECTIVE 3	ACTIVITIES
Fulfillment of sectorial objectives and national strategies through diffusion and implementation of the New Mining Law	Elaboration of national programme for the diffusion of the New Mining Law
	Implementation of the national programme for the diffusion of he New Mining Law
	Evaluation of the results and impact of the diffusion and implementation of the New Mining Law on a national level

I. PROPOSAL – TIMETABLE

OBJECTIVE 1.

ACTIVITIES	BUDGET $US	TIMETABLE
Systematisation and arrangement of existing proposals	**100.000,00**	**MONTHS 1 to 3**

Elaboration of the proposal for the New Mining Law based on contributions of the different sectors.		
Revision and presentation of the proposal to the competent authorities for approval.		

OBJECTIVE 2.

ACTIVITIES	BUDGET $US	TIMETABLE
Procedures for approval and enactment of the New Mining Law before the competent authorities	**200.000,00**	**MONTHS 4 to 10**
Design and edition of the New Mining Law		
Elaboration of didactic material on the New Mining Law for diffusion		

OBJECTIVE 3.

ACTIVITIES	BUDGET $US	TIMETABLE
Elaboration of national programme for the diffusion of the New Mining Law	**200.000,00**	**MONTHS 11 and 12**
Implementation of the national programme for the diffusion of he New Mining Law		
Evaluation of the results and impact of the diffusion and implementation of the New Mining Law on a national level		

La Paz, Thursday, January 29th, 2009

Annex 12 Letter of acknowledgement by COMIBOL

CORPORACIÓN MINERA DE BOLIVIA
DIRECCIÓN DE MEDIO AMBIENTE

La Paz, 8 de abril de 2009
MMM/COMIBOL/DIMA/COMP.3.-/0782/2009

Señores
Peter Appell
Per Kalvig
DANMARKS OG GRONLANDS GEOLOGISKE UNDERSOGELSE (GEUS, DENMARK)
Presente.-

Ref.: **Conformidad Informe de Misión de "Identificación de Oportunidades para la Promoción del Sector Minero en Bolivia"**

De mi mayor consideración:

A tiempo de saludarles, les informamos que la Corporación Minera de Bolivia (COMIBOL) ha recibido el documento informe final de ***"Identificación de Oportunidades para la Promoción del Sector Minero en Bolivia"***, realizado por GEUS por encargo de esta institución.

En este sentido mediante la presente nota, manifestamos nuestra conformidad y agradecimiento del trabajo realizado, así como efectivizaremos sus valiosas recomendaciones.

Con este motivo, saludo a ustedes muy atentamente.

Ing. Hugo Miranda Rendón
PRESIDENTE EJECUTIVO
CORPORACIÓN MINERA DE BOLIVIA

jvp/
c.c. Arch.

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