C R I T E R I A I N F L U E N C I N G

I N T E R N A T I O N A L M I N I N G

I N V E S T M E N T

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A project report submitted to the Faculty of Engineering, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Engineering

Johannesburg, August 1995

DECLARATION

I declare that this project report is my own, unaided work. It is being submitted as partial fulfilment of the requirements for the degree of Master of Science in Engineering in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

6th day of September 1995

ABSTRACT

The decision making process in international mining investment involves the collation and interpretation of an array of economic, political, technical and financial criteria. Furthermore, the conditions underlying these criteria are changing continuously and the potential impact on any mining investment decision has to be re-evaluated accordingly.

To provide a foundation to researching the current mining investment environment a survey was carried out at the end of 1993 to gauge the opinions of senior U.S. based mining finance executives and selected South African executives. The overriding view was that, since the mid-1980's, there have been major changes to the global (mining) investment environment of which the demise of the former USSR was cited as the most significant event. Not only has the USSR undergone major upheavals but there have been political and ideological changes in many developing countries. Accordingly many, if not all, of these countries are having to re-define their investment (and mining) codes in order to attract development capital from the wealthier, industrialized nations. The importance of political and administrative structures in the mineral development process was often highlighted.

Following the survey, and to define more clearly the underlying forces at play, a calculating framework was developed to simulate the performance of a mining project in various countries. A range of representative criteria were included in the simulation, drawn from the mining

investment codes of five countries; Chile, Indonesia, Papua New Guinea, South Africa and Zimbabwe. Discount cash flow techniques were used to compare the project's investment performance in each country, with particular emphasis on assessing the relative impact of various criteria. Cash input and output mechanisms were also developed to follow the distribution of the project's monetary benefits to the main participants, i.e. the host governments, the countries as a whole and the foreign investors (both equity and loan providers).

The simulation provided a framework to demonstrate a series of mineral economic principles and to explain some of the trends being seen in the current mining investment environment. Some philosophy on the costs of political and administrative structures was also touched upon.

It is hoped that the research effort can contribute in some way to better understanding the constraints bedevilling many countries' stagnant mineral industries. The current situation on the African continent, and its poor investment record over many decades, is of particular relevance to the theme of this research project.

DEDICATION

In memory of my father,

John Seymour Aylward,

20 May 1922 - 7 March 1986

ACKNOWLEDGEMENTS

Particular acknowledgement is made of senior U.S. based and certain South African mining executives who provided valuable time to participate in the interview survey. Their opinions and insight from decades of experience established the foundation for this research project.

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Last, but certainly not least, to Lorna and Lara for their patience and moral support, particularly during the many hours working through 'blind alleys'.

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1.0 INTRODUCTION

1.1 A Global Perspective

Throughout history the motive in investors' minds has been the same: to achieve the greatest return on investment for the minimal amount of risk. The element that does change continuously, however, is the composition of the investment environment; the participants, the resources, technologies and the geographic locality of asset deployment. Before making a decision to invest in a particular situation, or even remain invested for that matter, an evaluation of all relevant information would be essential. The process, when carried out diligently and interpreted correctly, would identify the most attractive investment alternative(s), inclusive of highlighting the risks involved.

The same investment principles can be applied to a mining development decision. Relevant factors which have to be considered in this instance would be the locality of the ore occurrence,, its concentration and volume, the commodity markets, labour productivity, infrastructure availability, the country or regional political and economic structures. Of extreme importance, however, would be the stability of the operating and investment environment over time.

In view of these basic investment principles, together with the fact that there have been enormous changes to the world's political and economic structures during the 1980s and early 1990s, there was considerable scope for further research.

A good example of a major change to the global political landscape has been the demise of the former USSR and the transition to the Commonwealth of Independent States (CIS). Not only have the effects been felt within and near the confines of the former USSR, but also in more distant countries who were sympathetic to its ideologies. Without the ideological support base the latter countries have had to re-consider their fundamental policies and create environments competitive enough to attract long term foreign investment.

Paradoxically, the international environment presents many opportunities (and potential returns) for investors but the risks may also be greater. The situation in many parts of the world is still in a state of "flux" and may take several years, or even decades, to stabilize to the point where the expected returns to investors outweigh the risks.

In the light of the new 'playing field', mining investors most certainly will have to revise strategies around new cultures, evolving politico-economic and legal frameworks, different business and negotiating

methods, and poor or non-existent infrastructure. Ultimately, however, the long term success of a new mining development will, to a considerable extent, depend on the relationship between host governments and the providers of capital. Two of the more important issues to be considered would be firstly, the equitable allocation of the benefits derived from bringing mineral resources to account and secondly, ensuring that the terms agreed upon will be respected over the life of a particular project.

Assuming that all the 'players' can agree to work together it is highly likely that new sources of mineral/metal supplies will be developed over time. This situation must eventually impact on commodity prices and, to minimize the impact of this risk, mining financiers would be striving to invest in projects with operating costs in the lower portion of the global cost curve.

The objective of the research project is to explore in more detail the criteria which have been influencing the flow of capital towards mineral development, and to devise a framework to evaluate their impact on the performance of a mining investment. It is hoped that the approach may contribute in some way to a better understanding of the structures needed to support a robust and wealth generating mining industry. Of relevance to this theme would be the situation in many

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of the African continent's mining industries which have operated far below their potential for decades.

1.2 Research Methodology

In the wake of the changes that have taken place in the international arena, such as the demise of the former USSR, various trends have already emerged which appear to be a reflection of the current mining investment environment.

One of the trends that has been given extensive press coverage over the past few years is the re-orientation of exploration focus of North American mining finance firms away from their home base. The developing regions have attracted much of this attention, with Latin America being the most prominent target. Some of the reasons cited for this trend were the uncertainty surrounding changes to long standing mining legislation (the U.S. 1872 Mining Law) and the lengthy and onerous environmental permitting procedures which add significant costs (and risks) to the project. Adding impetus to the migration to Latin America have been the well advertised revisions to mining investment codes in the region, of which Argentina and Peru have been at the forefront more recently. Chile continues to host a vibrant copper mining sector which has been achieved, not only through the quality of its mineral resources,

but also because of the country's competitive, stable and well administered investment environment.

To explore in more detail the criteria which have been influencing the strategies of North American mining firms, and to establish a practical foundation for researching the topic, a survey was carried out in the USA during October 1993. The survey was conducted by personally interviewing several (12) senior, U.S. based mining executives rather than adopting the easier, cheaper and more impersonal mailed approach.

After completing the USA survey and reviewing the results, it was realized that far more had been achieved than was initially expected. The level of seniority of the executives, their combined experience and co-operation made the exercise extremely worthwhile. It was then decided that the same issues should be discussed with selected South African executives to obtain a local perspective. Four senior executives were willing to participate and the interview phase was ended when a consistent base of opinion had been gathered.

The results of the survey have been presented in some detail because the opinions and comments made by the executives transcend, not only the more obvious technical factors affecting mineral development, but also the philosophies which determine long term

investment and planning strategies for mining finance and development companies.

Other researchers have recently undertaken surveys covering similar issues and the results of these have been compared briefly. Very clear and consistent messages emerged from the surveys which should be of some use to both host governments in their administrative capacities, and to the providers of capital (investors) in devising their investment and development strategies.

Although the executive and other surveys provided a foundation on which to better understand the salient criteria and philosophies influencing the current mineral investment environment, some means had to be devised to demonstrate the issues more definitively. Various approaches were considered:

* Undertaking an exhaustive search, collation and analysis of data on the global minerals industry and determining the forces which have produced particular trends.

* Carrying out a detailed case study on one, two or three specific projects, each in different countries, and determining the influence of the respective investment and mining codes.

* Adopting a more conceptual approach where the investment performance of a hypothetical mining project could be analyzed against a range of mining investment code criteria, the latter having been collated from a selection of countries.

Other aspects relating to the research process had to be considered:

* Consistency and standardization of data over periods long enough to identify trends.

* The time and cost of obtaining data for specific projects from proprietary sources.

* The confidentiality of the technical parameters and the strategic motivation behind those mining projects.

A further concern was that, by researching one or more project situations, the findings would become too specific and preclude global application. Comparisons would have had to be made with other mining investment situations in any event and the extent of the research process would have become prohibitive for purposes of this forum.

After due consideration of the above, and particularly because business decisions are driven predominantly by expectations of investment returns, it was concluded

that the development of a simulation model would be the most practical method of evaluating the issues. The simulation framework was designed to be flexible so that analogies could be drawn with any project anywhere in the world. The model also had to provide the means of measuring the range of impact of various criteria on a mining investment.

The flexibility of the simulation model has been significantly enhanced by current computer and information technologies; namely, extremely powerful modelling and calculating capabilities of spreadsheet-based programmes. The particular programme used for the simulation was Microsoft Corporation's Excel 5.0 for Windows. The programme provides the facility to link and interchange data which made the comparison of various measures between countries and mining projects more manageable.

In order to develop a representative calculating structure for the simulation, the mining investment codes of five countries were reviewed; Chile, Indonesia, Papua New Guinea, South Africa and Zimbabwe. The main reasoning for these choices, apart from the local interest in the latter two, was that they all had well established mining industries and, considering the current global trends, were developing countries.

In line with the conceptual approach, the performance of a hypothetical gold project (based on an average

sized Witwatersrand producer) was 'simulated' within each country's investment environment. The simulation model has been applied to the analysis of the following issues:

* The competitiveness of countries in their bid to attract international investment capital for mineral development.

* The relative impact of various criteria on the investment performance of a mining project in the selected countries.

* Rationalizing the results of the executive survey, particularly from the perspective of expected rates of return and payback periods.

* The distribution of the benefits generated by a mining project between the various participants, namely; the host government, the investors (both equity and loans), the employees and the providers of goods and services.

* Explaining some of the philosophies and mineral economic principles behind current investment trends.

The underlying stance of this research project has been one of complete neutrality and objectivity. It is a clinical evaluation of the mining investment business in the interests of progress and growth and not a

representation from the point of view of either the owners of capital versus the trustees of the mineral resources, i.e. mining finance and development companies versus the host governments/countries respectively.

1.3 Limits to the Scope of Research

The research process covered virtually every engineering, socio-political, legal, financial and philosophical discipline. It was impossible to expand on many aspects to the level probably required and expected by respective specialists. An added complication was that global mining and investment conditions are changing continuously. Limits had to be drawn somewhere. Essentially, the project revolves around the concepts underlying the development of a framework for mining investment decisions.

Mention should be made that the author has no formal accounting training but a reasonable grounding has been acquired after some ten years experience in the mining finance and investment analytical industry. The financial simulations have been managed entirely using cash flow principles and, to minimize the chances of inconsistent treatment between countries, the different sets of data for each country were applied to exactly the same calculating structure. The latter structure was developed around a wide range of criteria usually associated with an international mining investment.

It will be observed that sensitivity analyses have been carried out as part of the simulation exercise but on a single parameter change basis. It was appreciated that, in reality, other parameters were likely to vary within probability ranges, as per a Monte Carlo type exercise. However, the objective of the simulation model was to compare the actual combinations (by country) of known quantitative criteria, all other things being equal. Under the probabilistic conditions the combinations of criteria would have made it impossible to compare the impact of individual criteria. It is accepted, however, that the Monte Carlo principle is a natural extension to the theme of the project.

In essence, this research effort is the product of:

* historic knowledge of events that have impacted on the mining industry,

* the current geo-political environment,

* modern information (computer) technologies and,

* the perspective and experience base of the author, comprising sixteen years practical mining geology and mining finance and investment exposure.

Above all, it is hoped that the contents and interpretations have come closer to the truth.....

2.0 SURVEY OF THE OPINIONS OF USA AND SOUTH AFRICAN BASED MINING EXECUTIVES

To provide a foundation to researching the current international mining investment environment, a survey by interview was undertaken in the USA in October 1993 to gauge the opinions of twelve (out of 18 approached) selected senior mining executives. For additional perspective, four (out of seven approached) South African based executives were also asked to participate. The number of executives eventually interviewed was a function of travel costs, a personal budget and the compatibility of appointment times.

2.1 Motivation for the Survey

2.1.1 Mining investment climate in North America

There has been extensive press commentary during the past few years concerning North American mining firms diversifying their activities away from their home base, with a very definite emphasis towards Latin America (Mining Journal, various issues: 1992c, 1993a, 1993b, 1993d; E & MJ, 1993; MB, 1992). The main factors underlying this trend have been cited as increased pressures from environment protection regulations (and lobbies) and continued uncertainty pending changes to

the U.S. Mining Law of 1872.[1] These difficulties have contributed to increased legal, administrative and permitting times which can add significant costs to the mining development process. Some facts and figures on exploration expenditure by Silver (1993) support the gathering momentum of U.S. investment activity offshore.

These very real issues prompted the conclusion that senior U.S. based executives would be well versed in all the current criteria and philosophies influencing mining investment decisions in the international arena.

2.1.2 Constraints for S.A. mining firms

In contrast, and probably not through lack of desire, South African mining finance firms (mining houses) have been relatively restricted in expanding their global activities. The constraints were the result of the 'difficult' political situation in S.A. before April 1994 and the foreign exchange restrictions placed on residents and companies; the latter factor still remains a problem.

The origins of the mining houses may also have been a factor; in the sense that they themselves were products of capital investment from the industrialized nations a century ago. However, due to a diminishing inventory of

[1] Mining Magazine (1994e) provides a good overview of the history and issues surrounding the U.S. 1872 Mining Law.

local mining opportunities offering competitive returns for shareholders, a more outward looking strategy by all the mining houses has developed during the past few years (FM, 1993). Exploratory and other investigations into many geologically attractive parts of the world have been continuing.

An analogous situation to that of the North American mining firms is suggested for the S.A. mining houses where, just as Latin America is providing an attractive destination for the former, Africa potentially offers a range of opportunities for the latter. The circumstances behind the two groupings are different but the prospects of better returns, growth in earnings for shareholders and utilization of skills are a common denominator.

The point that needs to be emphasized is that South African mining houses have been relatively disadvantaged in the 'scramble' for new mining investment opportunities in the international arena.

2.2 Survey Methodology

2.2.1 Participants and interviews

Within the time allotted and budget constraints (personal funding) it was possible to interview sixteen executives from fourteen mining finance and related

firms. Their details have been provided in Appendix A, inclusive of the dates of the interviews.

It was decided not to mail out numerous (if not hundreds) questionnaires, but to rather interview selected executives (as senior and experienced as possible) and apply the principle of quality as opposed to quantity. It was also feared that the mailing method would result in low and extended response rates, as was experienced by Otto (1992: 330). It was felt that the interview approach would add spontaneity and more depth to the subject. In fact, several executives mentioned that the personal approach was appreciated.

Overall, there was tremendous co-operation and tolerance from all executives, for which the author is most grateful. It was agreed, however, that confidentiality be maintained as to identification with particular comments and opinions. The reason for this was that some of the opinions may not have been the views of the companies for which the executives worked.

2.2.2 Questionnaire design and responses

A questionnaire format comprising seven question topics was compiled to facilitate discussions and ensure consistency in the interviews. The question topics have been documented below for reference together with the discussion of the results.

The questionnaire was designed to be answered predominantly with numerical (or coded) responses but there was also considerable discussion and debate, in fact far more than was ever expected. For reporting purposes the averages of the coded responses have been presented below rather than itemizing the more than 500 individual entries. Assurance is given that this method accurately reflects the "mood" prevailing at the time of the interviews. It is believed the findings are still very relevant now - perhaps even more so because enough time has elapsed to confirm or refute them. Should further clarity be required in the interpretation of the average coded responses, the tables in Appendix B detail the distribution of the codes tendered for each question.

The total number of response "counts" for each question may not reflect the full number of executives. The reason for this was that some executives opted to give broad responses to the more detailed questions. This applied particularly to question topic 3 where executives preferred to combine the exploration and production phases of projects while reviewing the components of countries' investment and mining codes. Similarly, for question topics 4 and 5, where executives were asked to indicate their preference for various countries and regions, some felt that it was not necessary to differentiate between the exploration (topic 4) and production phases (topic 5). This then precluded some executives from offering expected

returns on investment and payback periods for the production phases in the selected countries. Two executives mentioned that they were not sufficiently up to date on developments in some of the countries and preferred not to respond.

If there were any deficiencies in the coded responses these were certainly more than compensated by the comments and opinions provided. It was deemed most important that all these views should not be 'lost' and was the principal reason for recording the details chronologically in Appendix C.

Although one hour was allocated, some interviews lasted up to two hours and was dictated by the time that executives were willing to provide on discussing anecdotal experiences and personal philosophies. In hindsight, however, the questionnaire was too long as the responses to questions 6 and 7 tended to become rushed and less focused. For this reason no clear conclusions could be drawn from those responses and the results have not been presented. The question topics appear only as a matter of record in Appendix D.

2.3 Discussion on the Survey Results

To discuss the results of the executive survey the following format has been adopted for each question topic:

* A record of the question topic (*highlighted in italic print*) for reference purposes.

* The results of the coded and other numerical responses, given as an average. Although the coded responses have been based on single integers, the averages have been recorded to one decimal point and should be interpreted in exactly the same way.

* The author's discussion and interpretation of the results, based on the opinions of the executives (refer to Appendix C for the individual comments).

* Additional views relevant to each question topic have been sourced from various references. These have been noted in a separate section after the discussion to avoid confusion with the opinions of the executives.

2.3.1 Question topic 1: Setting the scene

The following comment has been drawn from Anglo-American Corporation's 1993 annual review (AAC, 1993): "The changes taking place in (South Africa and) much of the world beyond us have widened the Corporation's horizons, offering the prospect of a challenging and dynamic period of renewed growth". Do you agree that this comment could apply to your company?

Responses:	**Yes**	**13**
	No	**1**
	Partially	**0**

Discussion and interpretation

There was almost unanimous agreement that a wide range of opportunities had emerged. These are, however, associated with radically different business environments and new strategies and management plans are having to be devised.

Ultimately, this situation has arisen from far reaching changes to global mega-political structures, e.g. the events surrounding the demise of the former USSR. An extension to these events is the trend towards privatization (of state owned or controlled assets) and pursuance of free-market principles, particularly in the developing countries.

One U.S. based mining executive has called this a 'push-pull' scenario; with the 'push' being generated by the prohibitive legislative and permitting procedures in North America, and the 'pull' stemming from modifications to many countries' investment and mining codes in Latin America.

Referenced opinions

Sir Arvi Parbo (1993) offers a stimulating view of the 'world environment for the minerals industry', covering the changes that have taken place (China and the former USSR) and the movement of mineral exploration activity

from the developed to the developing countries. Interestingly, it was observed that the operating environment was likely to require a new range of mining professionals with multi-disciplinary skills. Parbo describes these professionals as those 'who can see the answer before most of us have even grasped the question'.

2.3.2 Question topic 2: Global events and situations

The following situations appear to be influencing trends in international mining investment. What is your view of the degree of impact each has had, or is likely to have, on these trends? Enter codes for major (3), moderate (2), minor (1), or no impact (0).

Table 2.1 overleaf displays the average of the coded responses.

Discussion and interpretation

The principal driving force was concluded to be the trend towards privatization (de-nationalization) of state owned and/or controlled business entities. It was suggested by most executives that the catalyst behind this trend was the collapse of the former USSR. As a result, the support has dried up for many sympathetic political structures across the globe, many of which were situated in the developing world. In effect, the costs and uncertainties (risks) attached to doing

business within these centrally planned structures have now been reduced substantially.

Table 2.1 Survey responses: Events and situations

	Events and Situations	Averages of coded responses
a.	The collapse of the former USSR (6*)	2.5
b.	The politico-economic changes taking place in China (1*)	1.6
c.	The changing climate for mining investment in Latin America (8*)	2.6
d.	The pending changes to the U.S. 1872 Mining Law [2] (1*)	1.3
e.	The Mabo native title case in Australia [3]	1.3
f.	The global trend towards privatization (4*)	2.7
g.	The increasing attention to environmental issues (2*)	2.4
h.	The political changes in South Africa	1.3

NOTE: (8*) denotes number of executives choosing the event as having the most dramatic impact, as discussed below.

Are there any other situations which should be included in the list?

No other situations were suggested by the executives.

[2] See Mining Magazine (1994e).
[3] The case caused a major debate and introduced considerable uncertainty around security of title in Australia (Mining Journal, 1993c: 210-211).

Which situation(s) above, in your opinion, has(ve) had or will have the most dramatic impact on trends in mining investment? Please write a. and b. etc. and include a brief explanation for your choice.

The executives' choices for the most dramatic impact have been shown in Table 2.1 in parentheses, e.g. (8*). The number of responses total 22 because some executives gave more than one choice. This was due to the association of a. - the break-up of the former USSR with c. - the politico-economic rejuvenation of Latin America and f. - the trend towards privatization.

Discussion and interpretation continued:

In response to these new realities many countries have had to critically review and modify their political sympathies and foreign investment codes in order to attract foreign capital. There was likely to be further pressure to address these issues because the management structures controlling the world's capital pool have access to state-of-the-art information technologies. This has enabled investors to be far better informed about all the investment alternatives and the respective risks and returns.

These trends have not gone unnoticed by investors, particularly North American firms, which have shifted their mineral exploration and development emphasis away from the traditional areas of focus such as North

America and Australia. Adding impetus to the "migration" have been the increasingly onerous legislative and environmental procedures associated with mining development in North America. These were cited by the executives as being extremely difficult to manage and finalize.

There was widespread concern among executives about the increasingly vociferous "lobby" for environmental protection which is playing a major role in the decision-making, administration and development processes within the mining industry. Although the main thrust of the "lobby" appears to be concentrated in the First (or industrialized) World, it was widely felt that standards were likely to be uniformly applied throughout the developing countries as well. Some executives mentioned that the mining industry, as a cohesive front, could have done much more to present a balanced view of the costs and benefits of mining as applied to the welfare of society.

The net effect of these global factors is that the risk and return equation has tipped away from the developed or industrialized countries in favour of many lesser developed or "emerging" countries. Almost any part of the globe with favourable geology is a potential target, subject to political and legislative stability or war situations!

Referenced opinions

Aldous (1993) has elaborated on virtually the identical issues raised by the executives. It was more than coincidence that an Australian should be coming to exactly the same conclusions, but recommending a foreign investment strategy for Australian mining companies. The influence of the demise of the former USSR was mentioned as an important catalyst for a new world order. The paper is an excellent appraisal of the philosophies driving the global mining industry and appropriate investment strategies.

These issues have been commented upon widely in numerous other publications. Of note, for example, are articles in Mining Magazine (various issues: 1994b, 1994c and 1994d) on Peru which has been aggressively marketing its mineral development potential and advertising modifications to its investment codes. An extensive privatization programme has also been implemented in Peru.

Matthews et al. (1987) classified various situations affecting the investment decisions of U.S. based mining firms in terms of a 'push - pull' scenario, as did one of the executives interviewed:

'Push' investment from the USA: Low grade deposits, high development and operating costs and government regulations, i.e. environmental laws.

Then there is the lure of higher grade deposits in the lesser developed countries, lower labour costs and investment incentives.

'Pull' investment to the USA: Relative stability in respect of political system, economic policy, legal system and even the environmental laws, although harsh, have a semblance of predictability.

Then in developing countries there are uncertainties with political systems, government interference in management, changes to existing laws (minimum wages and taxes) and additional development costs, such as for training, schools and housing. The threat of nationalization is also a major fear of mining financiers because of the long term nature of the business.

The case of the Windy Craggy copper-gold deposit in British Columbia (BC), Canada is a good example of the uncertainty that environmental interests can introduce, thereby influencing the flow of development capital to the mining industry (Mining Journal, 1993e, 1993f). The promoters of this deposit had already spent some $US60 million on evaluating the property and then the BC government announced that the area was to be included in a national park and permanently protected. Compensation has been sought in excess of the amount spent on exploration because of the reserves delineated and the risks taken.

Are the 1990's Riskier ?

Do you believe that the current 1990's mining investment environment is riskier than at any other time during your professional experience?

Responses:	**Yes:**	**6**
	No:	**5**
	Undecided:	**3**

What principal factor(s) come(s) to mind in support of your view?

Discussion and interpretation

There was no clear cut consensus as to whether the current mining investment environment was riskier in the 1990's than at any other time in recent history (last 20 years or so). The executives, however, believed that "state-of-the-art" institutional financial and technological facilities were now available to counter the current risks. Several respondents mentioned that the multi-lateral organizations such as the World Bank, IFC (International Finance Corporation), and insurance cover provided by MIGA (Multi-lateral Investment Guarantee Agency) and OPIC (Overseas Private Investment Corporation), had contributed significantly to the stabilization of untested mining investment environments. Another factor tending to reduce the

risks was that the developing countries have been far more 'investor friendly' than they were.

Referenced opinions

Milton Ward (1993), Chief Executive, Cyprus Minerals Company (USA), covers many of the risk factors attached to foreign mining investment. In essence, foreign exploration is worth the risk at present and, in any event, many of the risks can be minimized with 'proper planning and use of safeguards'. Furthermore, although the likelihood of expropriation has been reduced significantly, mining companies must continue to build on relationships with governments, employees, environmentalists and landowners. Ward suggests some underlying philosophies driving current mining investment sentiment:

* The desire to find a major ore-body; the chances have diminished in the developed countries but there have been some major finds in Chile (Escondida), Indonesia (Erstberg-Grasberg), Russia (Udokan).

* Generally problems of foreign investment are still greater than domestic investment, so the orebody must be world-class to compensate for the risks.

The main conclusion that can be drawn from both the executive survey and Ward's opinions is that the potential benefits being offered by the developing

countries considerably outweigh the risks involved. One hopes that this can be sustained in the long term.

2.3.3 Question topic 3: Country risk factors

The following factors are consistently cited as the more important contributors to the success of mineral projects (assuming that the project specific factors such as geology, grade, etc. are considered favourable). What is your view of the importance of each factor in firstly, the exploration phase and secondly, the production phase? Enter codes for major (3), moderate (2), minor (1), or no importance (0).

Table 2.2 overleaf displays the average of the coded responses.

Discussion and interpretation

There was no doubt that political stability and administrative efficiency were the most important considerations for foreign investors in mining projects. Other important underlying criteria appeared to be security of tenure and foreign ownership laws, taxation policies and availability of foreign exchange. The latter issue was essential so that all financial commitments could be fulfilled, such as redemption of banker and customer loans, investors' remittances of capital and earnings, management fees and purchase of materials and equipment for the project.

Table 2.2 Survey responses: Country risk factors

	COUNTRY FACTOR	Exploration Phase	Production Phase
		Averages of responses given	
a.	Infrastructure, e.g. roads, etc.(1*)	1.4	2.5
b.	Climate (including altitude)	0.9	1.1
c.	Local skills availability	0.6	1.4
d.	Access to local databases (1*)	1.5	0.6
e.	Control of project management (2*)	1.8	1.3
f.	Previous experience in the country	1.6	1.9
g.	Political stability (8*)	2.8	2.9
h.	Legal system (1*)	2.8	2.7
i.	Foreign ownership laws (3*)	2.9	2.7
j.	Foreign exchange availability (1*) (including repatriation of earnings)	2.8	2.9
k.	Price controls on productive inputs	2.5	2.4
l.	Control over marketing of products (1*)	2.7	2.7
m.	Fiscal (taxation) regime (2*)	2.9	2.9
n.	Security of tenure (4*)	3.0	2.8
o.	Government efficiency, i.e. time taken for approvals	2.7	2.5
p.	Environmental regulations	1.8	1.9
q.	Host government's "understanding" of mineral affairs	1.9	2.0
r.	Involvement of agencies such as the World Bank/IFC and the EBRD. (1*)	1.6	2.0
s.	Insurance cover, i.e. MIGA, OPIC. (2*)	1.7	2.3
t.	Involvement of more equity partners	0.9	1.0

NOTE: The numbers in parentheses (8*) indicate the number of respondents that chose that (those) factor(s) as the most important.

Are there any other factors which should be added to the list?

No other factors were added to the list by the executives.

Discussion and interpretation continued:

By inference therefore, a truly representative and stable government was essential for the establishment and maintenance of a consistent and transparent (foreign) investment code. In other words, the 'goal posts' should not have a history of being moved around unexpectedly.

Interestingly, factors such as climate, infrastructure and skills' availability were not considered major obstacles in comparative terms. Environmental factors, although important, did not appear to be a major deterrent in relative terms because of the world-wide trend towards uniformity.

In essence, the greater the uncertainty and potential loss of control associated with an investment, the greater the risk premium attached to the expected return (see also section 4.1 on risks and returns). Looking from another perspective, the more uncertain the environment, the less the price an investor would pay for the same anticipated earnings profile. Investors must have sound, credible structures on which to base evaluations of the likely returns on their investment.

Most of the executives thought that differentiation between exploration and production phases was not necessary. All criteria would be carefully evaluated before committing funds even for exploration.

Referenced opinions

Cook (1986) undertook an analysis of non-Communist world mineral discoveries over the period 1943-1983 and provides a useful list of names, commodity, locality and owner. The analysis shows a marked increase in discoveries up to the mid-1960s and then a gradual decline. A key conclusion reached (Cook, 1986: 94), however, was that mining investors target countries with stable governments and who welcome foreign investment. Important underlying issues mentioned were sanctity of land tenure, competitive tax policies and ability to repatriate profits.

Coplin and O'Leary (1983: 52) have proposed a method of analyzing political risk as applied to the extractive industries. Essentially the methodology was a far more rigorous analysis of the factors in Table 2.2 so that comparisons could be made between countries. The two basic steps suggested were firstly, to assess the importance of political factors on the company's operations and secondly, to forecast the likelihood of each of these factors taking place in the future. Notwithstanding the detailed analytical mechanisms, the general theme revolved around the stability of the

regime and political turmoil; these must affect the permanency of policies and laws controlling foreign investment.

Project evaluation methods

Assuming the factors listed above have been assessed as favourable, how would you rate the following evaluation methods in the investment decision making process? Enter codes for essential (3), useful (2), of little use (1) or no use (0).

Table 2.3 Survey responses: Project evaluation methods

	Evaluation Method	Averages of responses given
u.	Internal rate of return (IRR)	2.3
v.	Net present value (NPV)	2.0
w.	Cost curve analysis	2.5
x.	Payback period (PBP)	2.3
y.	Sensitivity analysis	2.4

Discussion and interpretation

As far as project evaluation methods were concerned the average coded responses showed no definite preferences. In discussions, however, and considering the distribution of responses (refer to Appendix C), some emphasis was detected on cost curve analysis and payback periods. The usage of the payback period was not surprising because of the risks attached to investing in (developing) countries without records of

stability and competitive investment policies. As mentioned previously, many countries' investment codes have been changing rapidly to allay these perceptions and, in time, significant benefits should accrue to investors in the mining industry and the host countries.

As an overall observation, decision-makers appear to utilize all evaluation methods, but to the extent that the relative merits of an investment can be shown unambiguously against alternatives.

2.3.4 Question topic 4: Exploration attractiveness

What would be your degree of interest in commencing an exploration programme in the following regions and countries, firstly in the current 1990's decade and then, for comparison, assuming the environment that was prevailing in the 1980's? (If there is no change in a particular case then leave the 1980's space blank). Enter codes for strong (3), moderate (2), weak (1) or no attraction (0).

Table 2.4 presents the average of the coded responses and Figure 2.1 thereafter displays the same data in ranked, graphic format.

Discussion and interpretation

Latin America was clearly the most attractive region and registered the greatest change in sentiment for the better compared with that prevailing in the 1980's.

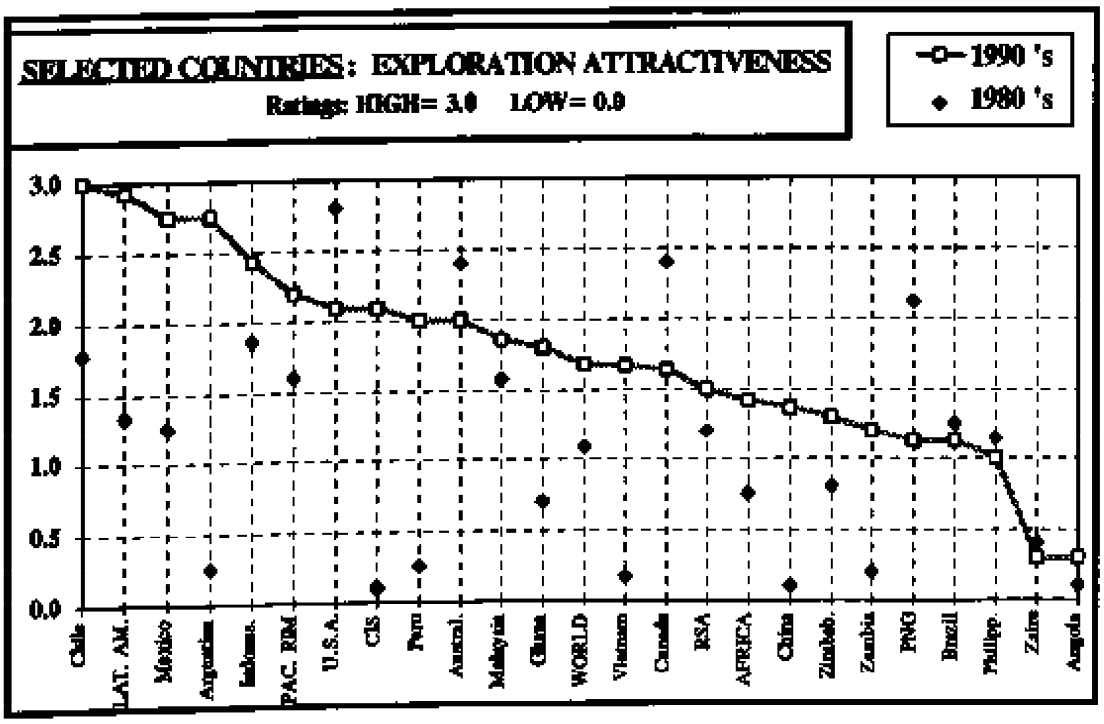
Chile, Argentina and Mexico were considered to be the most attractive countries, even featuring highly on a

Table 2.4 Survey responses: Exploration attractiveness

REGION/Country	Change	The 1990s	The 1980s
		**Averages of responses given	
AFRICA	+0.6	1.4	0.8
Angola	+0.2	0.3	0.1
Ghana	+1.1	1.8	0.7
South Africa	+0.3	1.5	1.2
Zaire	-0.1	0.3	0.4
Zambia	+1.0	1.2	0.2
Zimbabwe	+0.5	1.3	0.8
LATIN AMERICA	+1.6	2.9	1.3
Argentina	+2.5	2.8	0.3
Brazil	-0.2	1.1	1.3
Chile	+1.2	3.0	1.8
Mexico	+1.5	2.8	1.3
Peru	+1.7	2.0	0.3
PACIFIC RIM	+0.6	2.2	1.6
Indonesia	+0.5	2.4	1.9
Malaysia	+0.3	1.9	1.6
Papua N. Guinea	-1.0	1.1	2.1
Philippines	-0.1	1.0	1.1
Vietnam	+1.5	1.7	0.2
OTHERS			
Australia	-0.4	2.0	2.4
Canada	-0.8	1.6	2.4
China	+1.3	1.4	0.1
CIS	+2.0	2.1	0.1
USA	-0.7	2.1	2.8
World "Index"	+0.6	1.7	1.1

** The coded figures given for the regions may not equal the average of the underlying countries because some executives gave responses for the regions only. For clarity on this issue refer to the distribution of coded responses in Appendix B. World "Index" represents the overall exploration environment.

Figure 2.1 Exploration attractiveness: Country and region ranking



global basis. Although Peru did not appear to be as attractive at the time of the interviews, recent press reports (Mining Magazine, 1994b, 1994c and 1994d) suggest that sentiment could be changing; the country has been busy promoting its mineral potential and has modified investment policies. Brazil was not considered attractive in relative terms, but competition from neighbouring countries and their more investment-

friendly policies may force a change (see also referenced survey in section 2.4.3 later).

Interest in African countries appeared to have improved quite markedly in the 1990's from the very low base, not only in the 1980's, but for some three decades. The change in sentiment, however, was nowhere near as marked as that displayed for Latin America. It has been observed, since the democratic elections in South Africa in April 1994, a far more pervasive and positive mood has started to emerge throughout Africa.

The Pacific Rim area, i.e. Indonesia, Malaysia, Papua New Guinea, etc. was graded between Latin America (highest) and Africa (lowest) for mineral exploration attractiveness. Indonesia was rated the most attractive of the countries in the region, while Papua New Guinea (PNG) had lost much of its investor interest during the past 5 to 10 years.

The traditional interest during the 1970's and 1980's in Canada, the USA and Australia has definitely waned, with sentiment towards Canada declining the most. As mentioned previously, the legislative and environmental problems, coupled with the more positive business climate in the developing regions, have largely been responsible for the trend.

Interest in China and the CIS has increased markedly compared with the total lack of interest shown in the