BAMBURRA

Planejamento e Economia Mineral Ltda.

Caixa Postal: 37005 - 22.622-970
Rio de Janeiro - RJ - Brasil
Fone: (+ 55) (21) 2439-8153 / 2449-1756
Fax: (+55) (21) 2493-2881 / 2439-8168
E-mail: Bamburra@highway.com.br
Web Site: http://www.Bamburra.com

Evaluation of Mineral Properties:

Relevance of Establishing Standards

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Evaluation of Mineral Properties:

Relevance of Establishing Standards [1]

by Eduardo Vale*

SUMMARY

Without intending to give the final word on the matter, or even offer a properly new argument, the aim of this article is to reinforce the ongoing discussion on the relevance and opportunity of establishing standards to the evaluation of mining properties. Perhaps its contribution, if so, is associated with shedding light on the new dimension of concern with the subject caused by globalization and the need to enlarge the focus to encompass all the pertinent stages of the evaluation process as a whole and integrated system.

Unquestionably, within national boundaries the awareness of the importance of the theme is well embodied in the legal framework of several mineral producing countries, especially the traditional and developed ones. In these countries, the interface of interests between the mining industry and the private and institutional investors has for decades been stimulating a continuous up-grading of the rules, practices and guidelines to be observed in the evaluation process, on behalf of a well developed capital market whose keystone has been the protection of the investor.

In spite of the relative level of maturity of the legislation regulating the evaluation practice in countries such as the USA, Canada and Australia, to mention only a few, the impact of the Bre-X affair was strong enough to provoke a series of spin-off effects that transcend the regional scene. Abstracting the various initiatives already in course in these countries, the dynamics set forth from the globalization process fundamentally in terms of flow of funds, and pointing to an increasing integration of the capital markets as a consequence, suggest as the better course of action the preservation of the image and attainment of the long range objectives of the industry to start a concerted self-regulating movement at an international level. The evaluation process of mineral properties is discussed based on these reflections.

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* Mineral Economist
Director, **BAMBURRA** - ***Planejamento e Economia Mineral Ltda.***
Email: bamburra@highway.com.br

1. INTRODUCTION

The quantitative tools for the economic-financial evaluation of mineral properties - *prospects, deposits and mines* - traditionally catches the attention of a broad and diversified contingent of mining professionals. The interest permeates the different stages, ranging from field geologists, especially engaged in exploration activities and teams responsible for conceptual and feasibility studies and project management, to top management layers, *locus* of the utmost importance in making decisions on long term investments. It would not be an exaggeration to say that the valuation of mining properties holds a real professional fascination in the fundamental and irreplaceable support which it offers in decision making.

Of the three basic stages - *exploration, development and operation* - which characterize the specific aspects of the level of details and knowledge of a mineral property, the most thoroughly analyzed has been that of development. The valuation of mines, in operation or shut down, likely to be shut down temporarily or definitively, or reopened, lacks closer attention from applied mineral economics, whether at the level of international literature, or in the disciplinary scope of the traditional centers of specialization[2].

Traditionally, however, the greatest gap in terms of procedures and criteria in use lies in valuation of prospects, especially concerning properties where the collection of available geological information is far from the conceptual format of a deposit. In this context, where the extremely difficult situation is going against the flow in the figure of a **grass root property**, facing the component of subjectivity contained it it, the greatest challenge is concentrated in the attempt to create a consistent methodology based on objective quantifiable criteria.

A fundamental challenge in the economic-financial evaluation of exploration properties derives from the difficulty in using the methodological tools employed for deposits and mines. Depending on the property, the lack of objective geo-technical information which helps to give a technical-economic conformation, albeit approximate, at the level of wider possible conceptual outlines of the project, is especially detrimental to the effectiveness of using the discounted cash flow method. In this particular case, there is a wide gap between objectivity and consistence which may be obtained by assessing deposits and mines in contrast with the valuation of prospects[3].

Despite such setbacks, the acquisition of exploration properties, takeover and merger of companies with a portfolio of properties and drawing up exploitation

agreements, among others, obliges the professionals, who provide support for such activities, whether in the interests of the seller, buyer or in the context of issuing an independent valuation report, to use some valuation criteria which may suggest the attractiveness and value of the area and act as a reference point in the negotiation process.

The Bre-X case classified as a fraud by the specialized press pointed out the need and opportunity to start a general discussion and revision of concepts, criteria and procedures adopted in the process of evaluation of mining properties. Although supported by a process of manipulation of information geared from the exploratory works - *collection of samples and interpretation of core results* - and not from the application of mineral economics techniques or engineering conceptual design, the demonstrated audacity and effective cost imposed on the mining industry on a worldwide scale demand a vigorous corrective action in order to preserve the major and legitimate interests of the industry in the long run.

It should be added that the Bre-X case culminated in a succession of other similar cases, albeit of minor intensity and order-of-magnitude. In this sense, even excluding the expectancy component relating to the behavior of the price of gold, it was strong enough to provoke a considerable disarray at the expert confidence level that legitimates the flow of funds to the mining industry. In spite of some specialists interpreting the collateral cost effects as limited to the gold mining industry fundamentally in terms of its attractiveness to funding junior mining companies, in our view the worldwide image of the industry has been degraded.

2. CRITICAL VECTORS

Excluding the stage and level of knowledge of the property, the evaluation process should always address some key aspects that can be classified in three ample and fundamental dimensions: ***geological assurance, engineering conception and economic-financial modeling***. Below is a general and concise list of the activities and indicators embraced by each of these dimensions.

Considering the focus and space available this *check list* does not intend to be complete, but only to give a comprehensive sample of the most important aspects in

terms of its diversity and complexity serving as a reference to develop the argument [4].

Geological Assurance

- Legal Aspects
- Demonstrated Resources
- Delineated Reserves
- Continuity of Mineralized Zones
- Methods of Drilling and Sampling
- Density and Representativity of Sampling
- Level of adherence: geo (math) modeling versus classical methods
- Tonnage/Grade Estimates
- Assay Methods and Integrity
- Margins of Errors
- Quality Assurance and Control

Engineering Conception

- Tonnage/Grade Alternatives
- Stripping Ratio
- Cut-Off Grade Policy
- Open Pit Design
- Sequence of Mining
- Minimum Minable Width
- Mining/Process./Environmental Routes
- Mining Method
- Dilution / Specific Gravity
- Mining Recovery
- Processing Method
- Processing Recovery
- Transport
- Capital / Operational Costs

Mineral Economics

- Mining Agreements
- Business Climate
- Supply / Demand Relationship
- Available Market
- Price Behavior
- Capital / Operational Costs
- Mine Life
- Competitive Analysis
- Economic Evaluation
- Financial Engineering
- Taxation Planning
- Financial Evaluation
- Risk Analysis / Treatment
- Strategic Alliances / Joint Ventures

In reviewing these factors as a pad to critically observe the evaluation process we should note that they could be classified in terms of five principal groups :

- *assumptions and hypotheses;*
- *procedures and techniques;*
- *variables;*
- *parameters; and*
- *expectancies*.

In short and in a general sense[5], for each dimension there exists a proper set of criteria and the adoption of each criteria can be broken down into these five groups. As a consequence and offering stimulus to reflection in discussing the theme of this article some questions of fundamental importance may be asked:

- Which dimension – *geological assurance, engineering conception or economic and financial modeling* – is the most fundamental one?

- Which assumptions and hypotheses are critical at each stage level?

- Which parameters and variables are critical at each stage level?

- Do there exist some recommended procedures and criteria to estimate each of these parameters and variables?

- Which attribute(s) qualifies(y) criteria as pertaining to the mining industry array of best practices?

- Are some procedures, techniques and/or methodologies accepted as standards? To what extent, parameters and variables?

- What about the ever present potential loss of quality confronted in the process and suggested by the lag between the decision to adopt a conceptual recommended technique and the effective operational condition that governs its use?

- Considering the diversity of opportunities, the differences in expectancies and risk aversion preferences and the derived subjectivity component that permeates an expressive part of the decision process, does it make sense to talk about benchmarking?

Taking into account the wide diversity of situations in terms of minerals, properties, locations, stage of development, availability of data, etc., it is almost impossible to choose only one set of criteria as being the most pertinent. In fact, we have an inter-related and multidisciplinary chain of activities and decisions that should be finely tuned to adhere and accommodate the specific and unique aspects pertinent to each opportunity of investment under evaluation. The subjectivity aspects associated with expectancies, for example, impose a cumbersome task in any attempt to figure out a unique and most recommended route of procedures. The old fashioned, still so actual and not yet solved **terminology** challenge associated with the different classification of resources and reserves is a good example of the nature of the difficulties to be overcome.

3. RELEVANCE OF ESTABLISHING STANDARDS

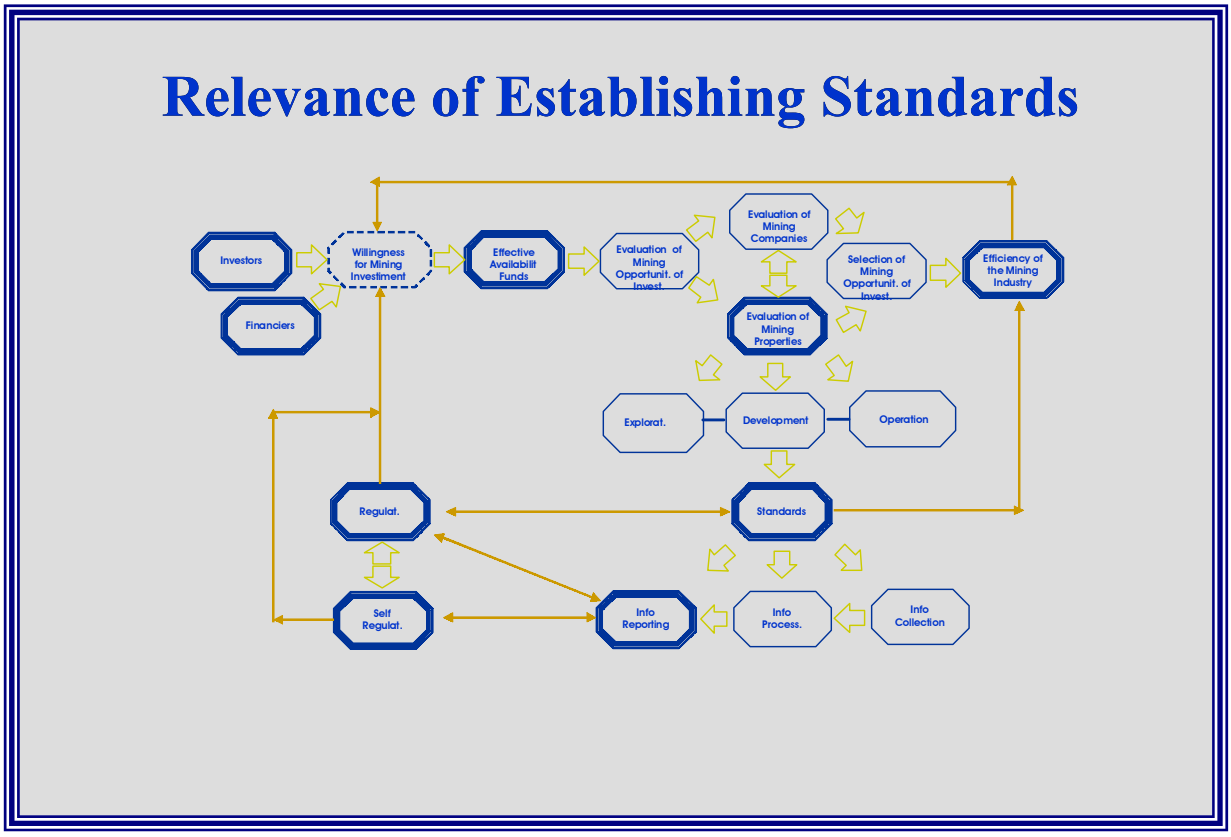
In Figure I we present a ***summarized profile*** of the suggested system that characterizes the **stronger conceptual relationship between the criteria used by**

the mining industry on the evaluation and selection of its investment opportunities and its capacity to attract the necessary flow of funds, in quantity, quality (*conditions*) and at the proper time, to support its growth path in the long run[6].

Beginning with the first quadrant, the *Effective Availability of Funds* - **EAF** to the mining sector at any time is dependent upon what can be denominated *Willingness for Mining Investment* - **WMI**. From the point of view of the mining industry, the **EAF** will be influenced by the **ever continuous monitoring and adjustment process conducted by *Investors* and *Financiers* in their portfolios in a dual approach to balance the maximization of returns to the appropriate level of risk exposure**. These players, depending on the nature, quantitative approach and refinement of the criteria employed to structure their portfolios, will be looking for the solution of this duality from several angles, such as location, sector, size of investment and time. In this context their decision process is critical to a sector such as mining.

On an aggregated basis, the long run *Efficiency of the Mining Industry* - **EFM** (second quadrant**)** will be supported to a considerable extent by the quality of the industry's decision process. In fact, the long range consistency of its growth path will be influenced by the development of the most economic set of mining opportunities of investment. So, at any time the quality and attractiveness of the set of projects being submitted to international capital markets will fundamentally reflect the effectiveness of the criteria adopted in the evaluation and selection of the mining opportunities. However, for the sake of the interests of any particular investor, as a matter of fact, the EFM is going to be judge in terms of the mining industry's added value to the overall results of its specific portfolio *vis-a-vis* its risk preference.

Beginning with this referential relationship, we could focus on this flow of activities, procedures and estimates that comprises the adoption of a criteria at each stage of the industry - *exploration, development and operation* - from another point of view and, ignoring the specific nature of the mining property, introduce into the proposed system three major and inter-related segments:



- **Info Collection**
- **Info Processing**
- **Info Reporting**

According to the system proposed at the interface of the industry with investors and financiers, the **WMI** will be influenced fundamentally by two vectors of concern:

- **Efficiency of the Mining Industry - EMI -** associated with the image of the industry, inferred from several indicators and dimensions and expressed at all the pertinent levels: *global, regional, country, sector, company and product*;

- **Info Reporting -** related directly to the mining opportunity of investment - *company and/or property* - under consideration. In addition to being influenced and constrained by the procedures and criteria used in the preceding segments - *Info Collection and Info Processing* - this channel of communication of the mining industry with capital markets has two potential filters in between: ***Institutional Regulation and Industry Self Regulation frames***.

Focusing on the advantages of a self-regulation process committed to increasing the quality and substance of the Info Reporting activity points raises some other pertinent questions:

- Which institutions should conduct this assignment in national boundaries?
- Are international reporting standards desirable?
- If so, who is the ultimate beneficiary?
- Is it feasible to achieve international reporting standards?
- If so, to what extent, dimensions and stages or segments?

4. FINAL REMARKS

- Traditionally gold mining is in the vanguard to attract risk capital. It is not by chance that it plays a prominent role in the sophisticated and unsurpassed Canadian capital markets. As such, considering the early stage of the globalization process and the strategic importance in granting funds to exploration, the mining industry cannot afford to underestimate the cost imposed on its image by such cases as Bre-X;

- In certain segments of the press it seems there is a bias in the argument to minimize what happened last year and qualify the Bre-X affair as an eventual and isolated problem[7]. In fact, it should capitalize this *momentum* to be proactive in reviewing its procedures and reassuring international investors and financiers about its commitment to good practice;

- The follow-up measures, reports and corrective proposals underway adopted after Bre-X are perhaps focusing too much on reserve classification and evaluation. In spite of its outstanding importance to the evaluation process, a series of numerous other aspects should also be reviewed in order to increase the quality of the information made available. So the scope should be enlarged to encompass the proper engineering conception and mineral economics aspects[1];

- Whenever possible and pertinent, at each stage of the industry and respective dimension of evaluation, the appropriate set of terms, concepts, procedures and criteria should be investigated, in order to present the industry's best practice. Using as an analogy and example, consensual stronghold practices, such as the importance of using control samples to manage the risk associated with assaying, should be investigated in the other areas;

- By definition, this course is a long range and probably never ending commitment, to be pursued at technical forums and gradually disseminated and consolidated at company levels. In this scenario, the majors have a unique role and a place of institutional leadership, considering their relative seniority appeal and bargaining power in face of investors and financiers point of view and interests. They can influence the market by lending a *golden benchmarking legitimacy* to their reports;

- Despite the inevitable time lag of this self regulation move, the returns to the industry in terms of an increase in the EAF could start accruing over a shorter period as soon as the international community of investors and financiers become aware of this by a considerable increase in the quality of the Info Reporting Products made available;

- In this scenario, the professional associations unquestionably play a fundamental role not only at national level in the interface with public institutions in charge of enforcing a national regulation frame, but at an international level in a concerted action embracing similar institutions, such as CIM, SME, IMM, and AusIMM, to mention a few;

- Moreover, a proactive self-regulation movement that departs from a common ground of accepted definitions and recommended operational guidelines, offering more transparent and security to the decision process besides contributing to restoring the scratched image of the industry, could minimize the

impact of the globalization process in terms of cost and time of adjustment for companies operating on a worldwide scale;

- At a national level it seems that the experience of the Australian mining industry in relation to self-regulation initiatives can be very useful as a initial reference to other countries. Of special concern it is worth mentioning **"The Valmin Code"** endorsed by The Minerals Council of Australia and adopted by AusIMM members. It embraces a code of practices for the evaluation of mineral properties emphasizing transparency, independence, materiality and responsibility[8] ;

- At an international level, as proxy for the open action to be conducted by the mining professional institutions is the ever growing movement among auditors in favor of uniting the accounting concepts, practices and reporting[9]. Focusing specifically on mineral-related aspects, as a first and natural step a good beginning would be to target the old and never solved resource/reserve definitions dilemma. In spite of the remaining difficulties, at a national level the more active and prominent institutions already have their proposed classification. The challenge is moving into an international standardization[10,11].

NOTES & REFERENCES

1. The second part of this article - **Discussing Standards from a Mineral Economics Focus -** is going to be address on a future issue.

2. This relative indifference is probably associated with the view that, when dealing with a mine, given the collection of technical information during its operation, there is less risk. Although, in theory, this expectation can be defended an extremely conceptual wealth from a series of practical challenges which, given their specific nature, would justify closer attention.

3. Vale, E., 1997. *Avaliação de Prospectos* (Evaluation of Prospects). Proceedings of the 10th International Gold Symposium. September, 29-30. Rio de Janeiro.

4. There is an ample list of references on this topic. Two comprehensive articles to be suggested are:

- Smith, L. D., 1994.Checklist for economic evaluations of mineral projects. CIM Bulletin, Vol. 87, No. 983, September, pp. 32-37.
- Ferguson, G., 1997.Resources and reserves estimation. MINING Magazine, September, pp. 163-168.

5. Abstracting the specific nature of a determined project.

6. This representation can be used as reference to international or regional capital markets without any sensitive adaptation.

7. Some authors even compile statistics by presenting the mining sector as one of the less susceptible to this kind of disarray. The common, weak and decisive constraint in this argument is embodied in its nature -*absolute comparison*

8. Appleyard, G.R. Evaluation Criteria and Standards in Australia. 10th International Gold Symposium. September 29-30, 1997. Rio de Janeiro.

9. It received a strong stimulus from the ever growing list of diverse national companies in international capital markets.

10. Vallé, M., McCutcheon, S., 1997. Are international reporting standards feasible?. CIM Bulletin, Vol. 90, No. 1007. February, pp. 30-37.

11. Silver, Douglas B., 1997. Gotta have mullets. Unsophisticated investors helped drive Bre-X fiasco. Mining Engineering, Vol. 49, No. 7, July, pp. 11-12.