National and international codes for reporting mineral resources and reserves: Their relevance, future and comparison

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Synopsis

The latter half of the 20th century has seen the proliferation of a series of codes to address commodity needs which were brought about by rapidly advancing technologies and the globalization of markets and consumerism. This paper addresses the specific needs and the origin of this surge and presents these codes in the context in which they were developed. It also compares the main codes or groups of codes and elaborates upon their strengths and weaknesses. Three main categories of codes are identified, namely codes for reporting to international agencies, codes addressing government needs and, finally, codes for the investors and the stock market. Codes governed by international agencies usually relate to strategic commodities which have highly specialized fields of usage such as nuclear power generation where international cooperation is eventually the only viable approach for both the development of technologies and their applications. Codes for reporting to governments address the necessity of each state to exploit its mineral potential profitably and to secure the preservation of wealth for future generations. Reporting to investors is experiencing a considerable popularity as of late because of globalization in mining and the growing need for outside financing of mining projects, whose capital requirements are getting out of reach for the average mid-cap mining company. All these codes have advantages and shortcomings dictated by the specific circumstances under which they were developed, therefore necessitating the definition and implementation of some kind of international standard whereby investments and the spread of information across political boundaries would be facilitated. Though none of these codes might ever become international in the true sense of the word because of significantly different legislations at national level, a step that would greatly contribute to the cross-border disclosure of information would be the reciprocal recognition of competent persons by the major mining countries, including China and Russia. It is also becoming essential that financial institutions and investors be properly advised on mining projects by reporting reserves and resources in a transparent and responsible way with the relevant public disclosures being compiled by professionals who take full responsibility for their submissions.

Keywords: reporting codes, mineral resources, mineral reserves, competent person, UN Framework Classification, IAEA classification, JORC Code, SAMREC Code and CRIRSCO.

Introduction

Mineral resources are available for different purposes and are usually classified in different ways depending on different needs. This is the reason that a great number of different classification systems were developed in various economic and political environments[1]. All of them have their *raison d'être*. Some of them were developed to address the needs of developing technologies and their applications where international cooperation is of paramount importance and where regulatory mechanisms have to be implemented at super-national level. The necessity for countries to know and protect their mineral potential to the benefit of current generations as well as future generations is a continuous concern that has also to be properly addressed. At the bottom of this pyramid of interests and priorities lies the mining confraternity, which makes it all possible, with its interrelation with financial institutions and governments and its basic need to attract investments and produce wealth. This paper elaborates on the main classification systems arising from the varieties of needs mentioned above. The main categories of codes for reporting mineral resources and mineral reserves can thus be divided broadly into three groups, namely reporting to super-national agencies, reporting to government and reporting to investors. In the final analysis, most mineral resources might well end up to be reported in all these systems for different reasons and with cosmetic changes in wording only.

Classifications for reporting to super-national agencies

Scope and background

International organizations are usually processing data which has been submitted

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 SA ISSN 0038–223X/3.00 + 0.00. The paper was presented at the SAIMM Symposium: Applications of Computers and Operations Research in the Minerals Industries*, 14–16 May 2003.*

officially by various governments through specialized institutions. This is done in order to keep a consolidated global inventory of strategic commodities. Such inventories are usually kept for energy minerals, such as coal, oil, gas and uranium, and are made available to all member states. This process is the result of agreements between member countries. In this paper the uranium scenario is elaborated upon as a case in point. For the International Atomic Energy Agency (IAEA), the stated primary objectives of the classification are to promote cooperation between its member governments on the safety and regulatory aspects of nuclear development and, on assessing the future role of nuclear energy as a contributor to economic progress[2].

Fundamentally, the founding member countries have the following basic objectives:

- to keep under review the technical and economic characteristics of the nuclear power growth and of the nuclear power cycle
- to assess supply and demand for the different phases of the nuclear fuel cycle
- to obtain information on the uranium resources and reserves of other member countries.

These objectives are ultimately aimed at enabling the member countries firstly to carry out strategic planning both to safeguard their own mineral resources and to guarantee supply for future generations (users) and, secondly, to exploit and sell their mineral resources under the most advantageous market conditions (producers).

For uranium in particular, the necessity to have an international inventory was triggered by two unusual events in the last century which produced incredible and major overreactions in marketing and mining. The first was caused by the development of nuclear weapons in the USA in the mid-1940s, in a critical moment of that country's history. The uranium ('yellow cake') required for the nuclear weapons was fortuitously obtained from Belgium a few years earlier. That uranium was produced from the Shinkolobwe mine in the then Congo[3]. The Shinkolobwe mine produced uranium as a by-product of copper dating from the 1920s. Considered of doubtful commercial value at the time, the yellow cake was casually bagged and routinely shipped to Belgium where it was kept in storehouses. It was then distributed at a nominal price to academic and research institutions all over the world for research purposes. In any event, the USA became a nuclear power nation with neither a national uranium strategic stockpile nor its own uranium-producing mines[3]. Further there was no steady and reliable foreign supplier. The competing nations such as Russia and England were in no better state. In addition to promoting uranium prospecting at home, the USA initiated then a campaign of investments in foreign countries to secure a steady supply of uranium for its armament programme. Its financial commitment abroad consisted of covering all costs related to uranium mining and production plus an incentive of the order of 10% or higher. A major target was the Witwatersrand (Wits) Basin where uranium has already been detected in 1915 in the ore processed by the gold mines. Uranium production from the Wits gold mines started in 1952, with the first uranium being produced in West Rand Consolidated mines. In the 1960s the decline in the military requirements of the USA and UK slowly rationalized production in many centres[4]. It was at that time that detailed uranium inventories were generated, with the resources being classified on the basis both of exploitation costs per unit uranium produced and of production capabilities. That can be taken as the beginning of the classification standard for uranium resources in the Western world. Unfortunately, these inventories and the classification definitions were considered secretive and were never fully made available to the public.

The second event was the worldwide proliferation of commercial nuclear power plants in the 1970s which spearheaded a worldwide prospecting boom, the like of which had not been seen for many decades. However, through a series of well-publicized nuclear power plant accidents in the early-1980s and the consequent negative shift in public opinion, reliance in nuclear power generation faded away. As a result, many planned nuclear power plants were put on hold indefinitely causing the renegotiation of existing uranium contracts whereby the delivery of the uranium still outstanding was postponed in definitely or stretched out over a longer period than provided for in the original agreements. Consequently, the uranium price dropped and the long-term uranium requirement projections were reassessed more conservatively. The prospecting boom underwent a drastic rationalization and was soon over. The financial loss was significant and, when considered in a global scale, it was possibly the major financial setback that the mining industry experienced in the 20th century.

The IAEA uranium resource classification system

It was during the 1970s, at the peak of the uranium exploration boom, that the IAEA finalized its resource classification. The base of the classification is twofold, namely resources are expressed in terms of metric tons of uranium metal, and the classification is structured both on exploitation costs and confidence in the estimates.

The cost is the cost in US dollars to produce one kg of uranium metal. It includes all direct and indirect costs for mining, environment, waste management, processing, capital and overheads. The cost categories are three, originally covering the following intervals[2]:

- uranium metal exploitable at costs of up to $80/kg U
- uranium metal exploitable at costs between $80–$130/kg U
- uranium metal exploitable at costs between $130–$260/kg U.

Since the classification is reliant on costs, regular updates are necessary in order to be in line with supply and demand, though the cost intervals shown above lasted well over a decade. The resource estimates are divided into separate categories reflecting different level of confidence in the quantities reported, namely (Figure 1):

- Reasonably Assured Resources (RAR)
- Estimated Additional Resources—Category I (EARI)
- Estimated Additional Resources—Category II (EARII)
- Speculative Resources (SR).

The definition for RAR is given here as an example, please see the relevant publication[2] for further details.

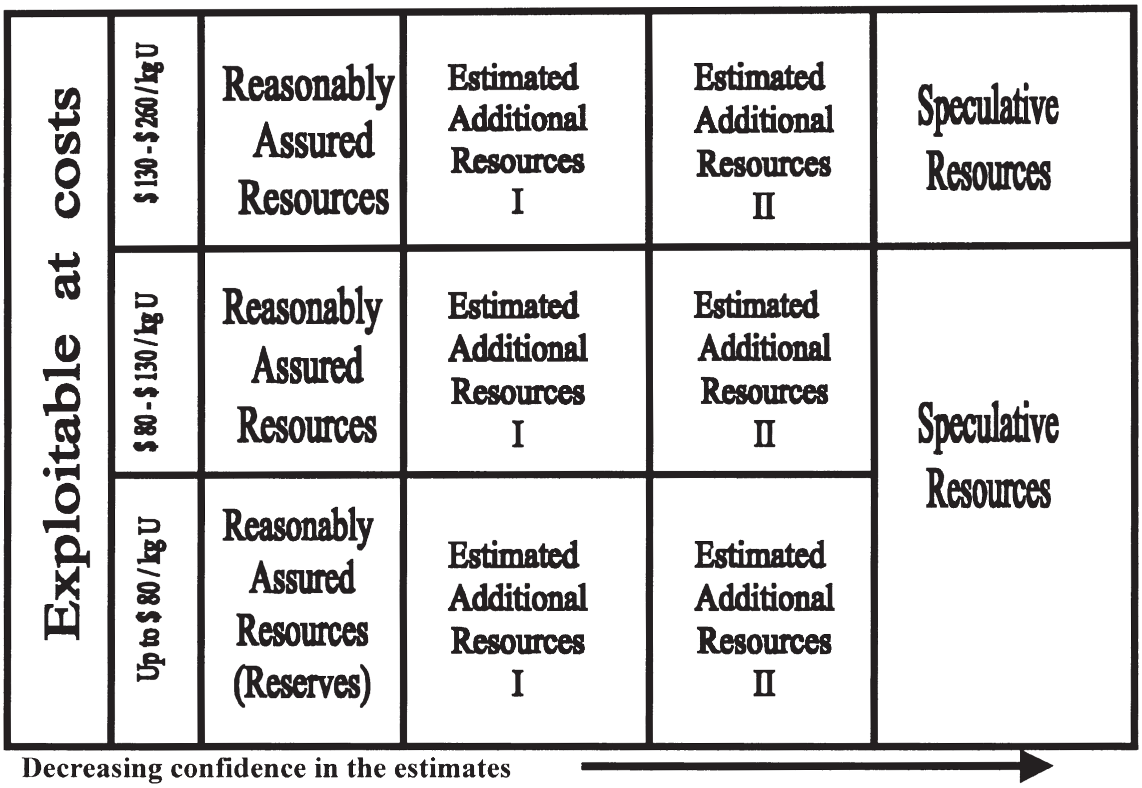

Figure 1. IAEA classification scheme for uranium resources, after OECD[2]

'*Reasonably Assured Resources (RAR) refers to uranium that occurs in known mineral deposits of such size, grade and configuration that could be recovered within the given production cost ranges with currently proven mining and processing technology. Estimates of grade and tonnage are based on specific sample data and measurements of the deposits and on knowledge of deposit characteristics. Reasonably Assured Resources have a high assurance of existence and in the cost category below $80/kg U are considered as reserves for the purpose of this report.*'

The reporting of resources also takes into consideration the status of the production centres, i.e. existing, committed, planned and prospective as well as their production capacities and capabilities.

Strengths and weaknesses

The classification is simple, logical, and easy to apply. That, together with the fact that most of the Western world countries were members of the IAEA contributed to render it a very successful classification during the 1970s and 1980s.

The weakness of the classification is that the resources are reported as tonnages of uranium metal, generally interpreted as available *in situ*, though some national organizations went a long way in assessing mining losses and recovery factors in their submissions to the IAEA[5,6]. Actual tonnage of ore and the relevant grade for individual deposits or for each resource category are not generally or consistently divulged by the reporting national organizations. Further it is not required to disclose the name of the competent person (CP), because the government organization responsible for the compilation of the report is expected to take responsibility for it.

Classifications for reporting to government

Scope and background

Each government is interested in obtaining as correct an overview of its mineral resources as possible. There are different reasons for this interest[1].

- *Establishment of national inventory*—Every government has to know which commodities are available domestically, what has to be imported under normal circumstances and in exceptional circumstances, and what are the potential exporting capabilities.
- *Land use*—Exploitation of mineral resources often does not allow any other use of land. Knowledge of mineral resources, particularly their eventual exploitation, is needed in order to decide upon the priorities of land use.
- *Environmental regulations*—These regulations are becoming more and more stringent and only those resources that meet their requirements are allowed to be used. Knowledge of the impact on the environment which an eventual exploitation will produce is thus becoming extremely important.
- *Strategic planning—Governments are interested in* their national resources potential, vis-à-vis the availability of commodities from the international market, for strategic planning of their national economies and development. This is the reason that exploitation of mineral resources is always strictly regulated and government bodies are taking care that mineral resources are exploited in a proper and sound manner. This is assured through different licensing requirements.

Governments are therefore interested in obtaining the most comprehensive set of data on mineral resources.

A typical example of a code generated for the purpose of reporting to government is the UN Framework Classification[7,8]. The main motivation behind the compilation of such a code was the liberalization of the former Eastern Bloc at the fall of communism in Russia in 1990[9]. As a consequence, Russia and its former allies realized that in order to attract international capital to develop their mineral resources they needed to report their mineral potential in a way that was understood by the Western world, particularly by the market and the financial institutions. At the same time the immense wealth of detailed information stored in their large databases, which was the result of years of painstaking collating of data by a large workforce, had to be kept and updated without major disruptions or changes. This had to be done for two reasons, firstly this information represents an invaluable asset to the state and secondly the whole reporting system consists of a rigid but well organized structural framework which is deeply rooted in the mining tradition of these countries. The UN-ECE was chosen as the vehicle to develop such a classification. Given that background, the committee (Task Force) responsible for its compilation consisted predominantly of representatives of ex-communist countries[7]. This somewhat influenced the development of the Framework Classification along lines familiar to the majority of members. The resulting code turned out to be mostly suited for inventory purposes, ideally for reporting to government rather than to the market, though the latter had been the intended original objective. In line with all these needs, the UN Framework Classification defines its main objective as to create an instrument that would permit reserves/resources of solid fuels and mineral commodities to be classified on an internationally uniform system based on market economy criteria and to incorporate local terms into it in order to make them comparable and compatible with existing international terms, thus enhancing international communications[7]. In doing so, the Framework Classification '*should directly reflect the procedure used in practice to investigate and evaluate mineral resources and should accommodate the results of these investigations and evaluations*'[7], which is an ambitious objective by all standards.

The UN Framework Classification

The UN Framework Classification is a three-dimensional system which incorporates three sets of relevant mineral resource parameters: Economic (E), Feasibility (F), and Geological (G). A block, such as block 121 in Figure 2, is identified by three numbers, each representing one of the three parameters and sorted in alphabetical order (EFG). In turns, each block represents a class of resources. A total of

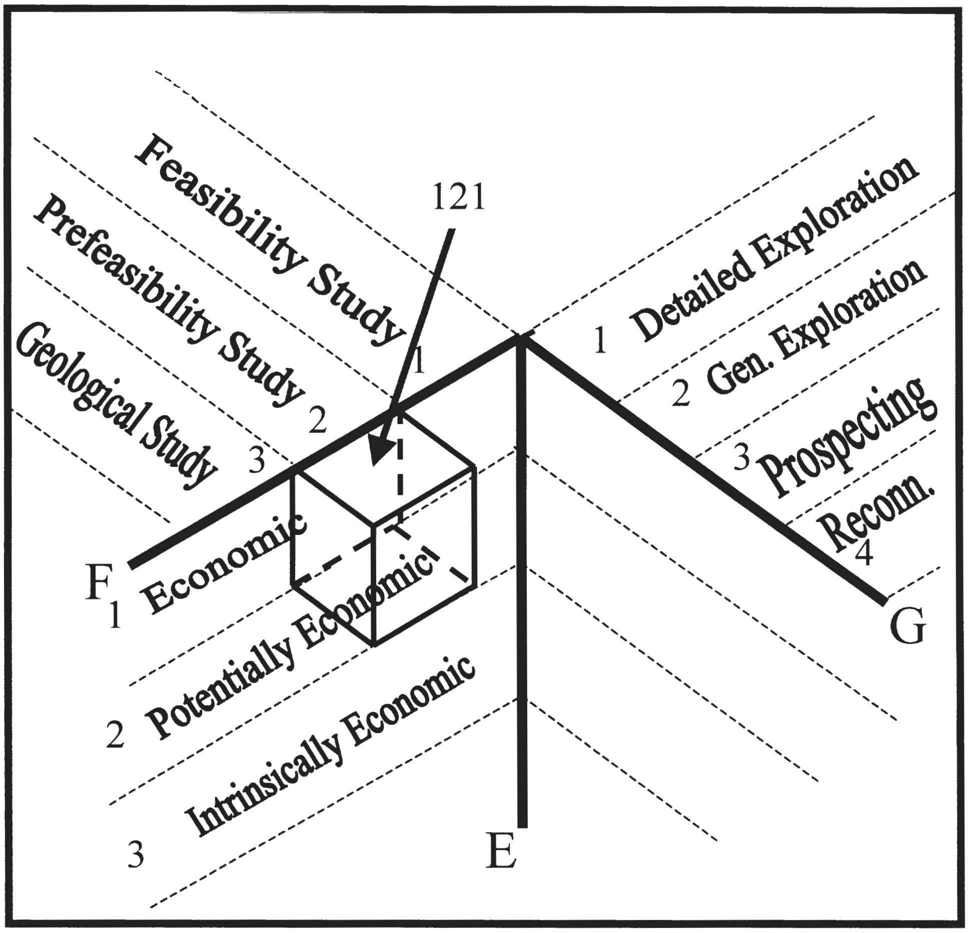

Figure 2—UN Framework Classification

36 classes (3Es × 3Fs × 4Gs) can be accommodated, though the classification is open ended for all practical purposes. The UN Framework Classification considers only 10 categories as being of practical use, namely 111, 121, 122, 211, 221, 222, 331, 332, 333 and 334.

The system is designed primarily for inventory purposes because it is ideally suited to cover all types of mineral occurrences and deposits regardless of whether they can realistically and profitably be brought to production now under current economic conditions or in future under projected market trends. The classification is theoretically engineered to indicate the specific stages of feasibility and prospecting each project has been subjected to at the time of reporting, thus making it possible for potential investors or governments to estimate the required time and capital needed to bring the project to fruition. Surprisingly, the intent is not matched by the deeds in practice because the Framework Classification is not prescriptive with regard to reporting details; consequently it is not clear whether important information such as locality, geology, tonnage, grades and other relevant parameters for each deposit or globally for each class have to be reported and to what extent. It is presumably implied that reporting is done to the detail required by local legislation, thus filling the grey areas left behind by the Framework Classification. By its own nature it is a system for mineral resources (*in situ*) and not for mineral reserves (ore reporting to the mill), as clearly indicated in its '*Final Version*'[7], and as understood by most of the member countries of the ex-communist bloc. The incorporation of JORC-type definitions (which are quoted side-by-side with their equivalent definitions of the Framework Classification in many publications) particularly after the Geneva Accords[10], is a forced merger that keeps the dichotomy between the two systems very alive. In addition, the definition of CP is too vague to be of any practical significance and gives the impression of having been forcibly added in, again to be in line with JORC. That definition states that a CP '*is defined as one who is qualified for the position by training and who has relevant experience in assessing resources and reserves of the type of deposit in question*'[7]. No mention is made of any accountability or membership to a professional body with an enforceable code of conduct. Further the disclosure of the name of the CP is not strictly required. Though not specifically mentioned in the Framework Classification, the system seems to have been designed for submission to the state by organizations rather than by individuals, well in line with the traditional way of reporting in the Eastern Bloc of countries.

Strengths and weaknesses

In the final analysis, the Framework Classification is a remarkable system, open ended and ideally suited for inventory purposes and for reporting to government. It would then be the responsibility of governments to make public the amount and quality of information that they feel would be adequate. One shortcoming of this classification is the low-key impact, if any, it has on large financial institutions, which is underscored by the fact that, to the knowledge of the author of this paper, there is no major stock exchange that has endorsed it. However, regardless of some debatable shortcomings, the Framework Classification in combination with local statutory reporting requirements has the potential, amongst others, of being useful to foreign mining groups intending to invest there, assuming that the level of detail about individual deposits is adequately and comprehensively made available to them.

Classifications for public reporting to shareholders

Scope and background

During the last decade of the 20th century the focus has dramatically shifted to reporting to the investors. This has been the driving force behind the proliferation of codes in the past few years. Their intrinsic characteristic is the necessity to report mineral resources that can be exploited economically within a relatively short period as against potential long-term resources and occurrences that are perceived to have mostly an inventory significance. Companies are not necessarily interested in resources if they have no reasonable prospect for economic exploitation in the near future under expected market conditions. Therefore, companies have significantly more limited interest in mineral resources than governments. This is also the reason that classifications based on commercial needs are usually simplified and do not cover or report on sub-economic deposits in a comprehensive way[1].

Even more constrained is the interest of the financial community. As the exploitation of resources requires large amounts of capital, financing from external sources is usually necessary or preferred. This is generally carried out in three ways, namely equities, loans and, rarely in the Western world, contributions from government and super-national institutions. To obtain such financing a *bankable document* is generally required. The financing world is therefore primarily interested in mineral reserves and in those mineral resources which secure with a high degree of certainty that the capital invested will yield the expected interest and will be paid back within the planned period[1].

These types of codes have their roots in history with a well-known precursor being '*De Re Metallica*', by Georgius Agricola, first published in 1556. In it, Agricola discusses the evaluation of deposits, the relationship between miner and owner, and fraudulent behaviour in mining[9]. In the late 1990s the necessity to report transparently to shareholders and potential investors has slowly become a *sine qua non* condition to obtain investments. The trigger has been a rise in reporting scandals. In the 1960s the so-called Poseidon nickel boom resulted in warnings from the Australian government and regulatory bodies that, unless the mining industry developed appropriate reporting standards, the regulators would do so. In response, the Australian industry established a committee known as the Joint Ore Reserves Committee (JORC). This committee published the first version of the JORC Code in 1989[11]. That code was to become the foundation on which all recently developed national codes are built. In 1997 the need for international standards and stronger control on the reporting of mineral information was made painfully obvious by the Bre-X scandal concerning the fictitious Busang gold deposit in Indonesia. Even though it was recognized that regulations alone could not have stopped Bre-X from happening, the lack of standards, and the lack of procedure to ensure that these standards are followed, was perceived as a significant contributing factor[12]. In South Africa the case of Noble Minerals Ltd in the late 1990s was also a case in point. Local codes were developed in South Africa (SAMREC Code)[13], Canada (National Instrument 43–101)[14], England (The Reporting Code) and the USA (SME Guide) as a result of these events. All these codes are 90% or more JORC Code compatible and adopt the Denver Accord definitions in full[15,16]. The differences between the various codes are *under the skin* and have been brought about in order to meet the requirements of local legislations, traditions and cultural environments. They have been discussed comprehensively in other publications[17] and need not to be elaborated upon here. These codes can thus be taken as one set of reporting rules and together can be viewed as an *international code* for public reporting of mineral resources and mineral reserves to shareholders and finance organizations in the industrialized countries.

The JORC-type codes

The JORC-type codes are based on seven definitions as defined by JORC and the Combined Reserves International Reporting Standards Committee (CRIRSCO) of the Council of Mining and Metallurgical Institutions (CMMI, now defunct). These definitions are: mineral resource, inferred mineral resource, indicated mineral resource, measured mineral resource, mineral reserve, probable mineral reserve, and proved mineral reserve. Their relationship is shown in Figure 3.

These codes incorporate very specific and unique features[18].

- ➤ Their compilation is usually the result of the cooperation of all stakeholders. In the case of the SAMREC Code, its compilation was carried out by representatives of the South African Institute of Mining and Metallurgy (SAIMM), the Geological Society of South Africa (GSSA), the Geostatistical Association of South Africa (GASA), the Association of Law Societies of South Africa, the General Council of the BAR of South Africa, the Johannesburg Securities Exchange (JSE), the Council for Geoscience, the South African Council of Banks and the Chamber of Mines of South Africa (CoM), which represents the South African mining houses. In addition, there was representation from three professional statutory bodies, namely the South African Council for Natural Scientific Professions (SACNASP), the professional body for geologists and related professionals; the South African Council for Professional Land Surveyors and Technical Surveyors (PLATO) and the Engineering Council of South Africa (ECSA), which also incorporates mine managers. That is as wide a participation as it can possibly achieve. Because these codes are endorsed by all major shareholding organizations, they are therefore binding on the members of these organizations.
- ➤ Mineral resources are tonnages and grades of the *in situ* ore estimated over a realistic stoping width or bench height, while mineral reserves are estimates of tonnages and grades of the material reporting to the processing plants (run-of-mine). In addition, all relevant details such as mine call factor and metallurgical recovery factors are required to be disclosed in most of these codes.

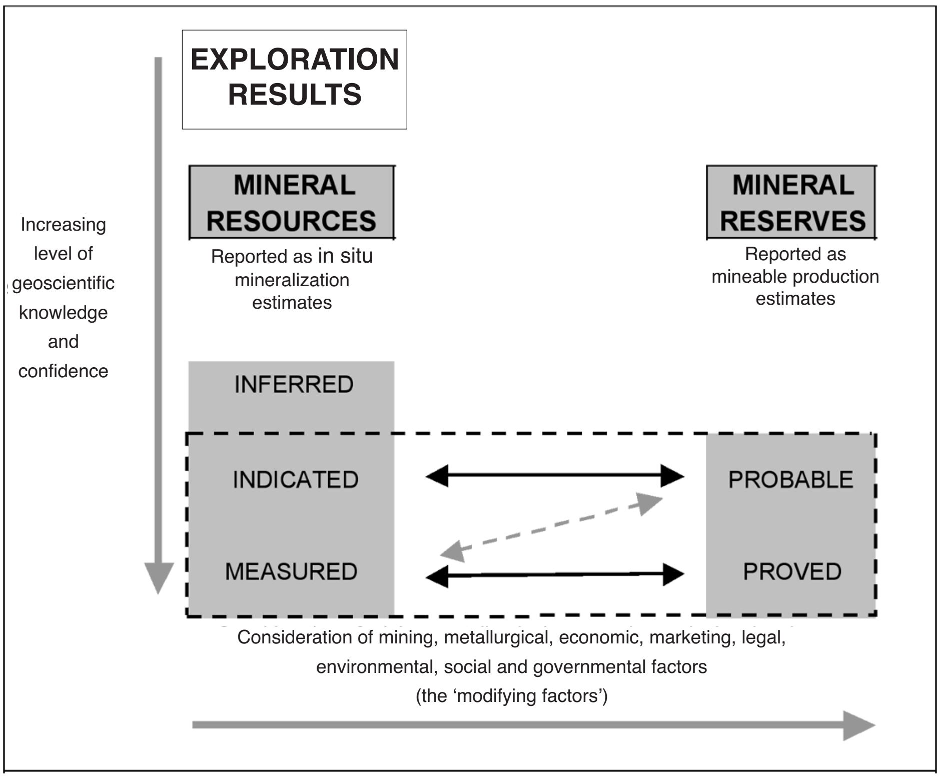

Figure 3—JORC-type classification of mineral resources and mineral reserves

- Mineral reserves are the economically mineable portions of a deposit, for which extraction is reasonably justified at the time of reporting. Mineral resources must have reasonable and realistic prospects for eventual economic extraction. Also, portions of a deposit that do not have reasonable and realistic prospects for eventual economic extraction must be excluded from mineral resources. This implies that a minimum but realistic cut-off grade must be applied when estimating mineral resources.
- Mineral resources can be reported either inclusive of mineral reserves or exclusive of mineral reserves. In the case where mineral resources are reported inclusive of mineral reserves, the *relevant details* of the mineral resources which have not been modified to produce mineral reserves for economic or other reasons *should* be included. In the South African context the SAMREC Code specifies that the *relevant details* of the remaining resources are grade and tonnage and they *must* be included.
- A major difference from other types of codes is that public reports must be based on and fairly reflect the report of a CP and shall require their written approval for the relevant parts of thei report included in the document. In many codes it is required that the public report shall disclose the CP's qualifications, professional affiliations and relevant experience.
- A CP is such on their own recognizance but their must be clearly satisfied in their own mind that they could face their peers and demonstrate competence in the commodity, type of deposit and situation under consideration. It is mandatory for a CP to have a minimum of five years' experience relevant to the style of mineralization and type of deposit under consideration. In addition, the Codes also require that they belong to a professional body with an enforceable code of conduct. In South Africa membership to one of the three statutory organizations for mining professionals is required. In any event a CP is legally accountable for the relevant parts of a public report for which he has signed responsibility regardless of their affiliations and whether they is aware of the legal implications they is under by signing the report.

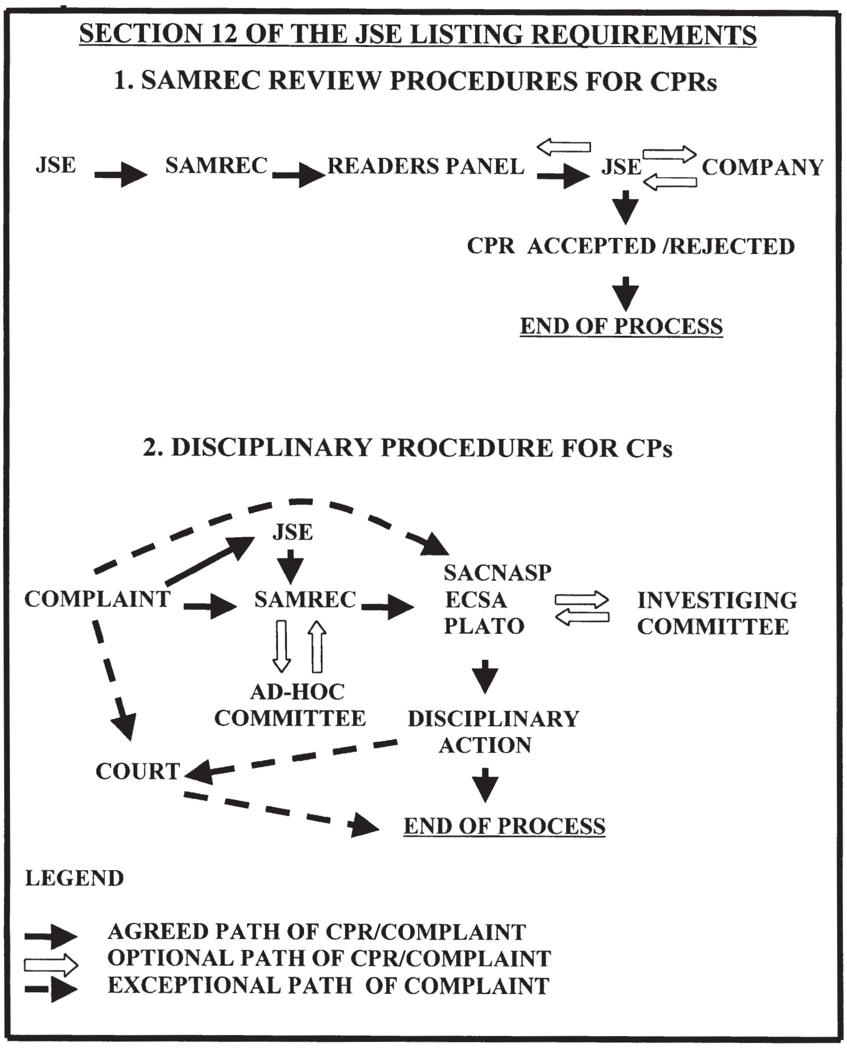

Figure 4—Main envisaged aspects of the review process for competent person reports (CPRs) and disciplinary procedure for CPs as part of the JSE/SAMREC/ statutory bodies agreement, according to Camisani-Calzolari[18]

- Of extreme importance and the *raison d'être* of these codes is their official adoptions by the local stock exchanges. This is generally the case with the notable exception of the Security Exchange Commission (SEC) in the USA and the London Stock Exchange (LSE). The former relies on an older classification which is now out of tune with the JORC-type codes, and the latter is still in the process of assessing the impact of the adoption of *The Reporting Code*. In the case of South Africa the section of the JSE relevant to the listing requirements for mining and exploration companies (Section 12) was recompiled in 2000 in order to incorporate and endorse officially the SAMREC Code[18].

The CP is a fundamental concept in these codes. Some stock exchanges have instituted independent technical readers' panels in their approval process for public reports. Others have different control mechanisms[14], which are equally efficient. In the case of the JSE any material unresolved complaints concerning a CP will be referred by the JSE Listing Division for disciplinary action by SAMREC to the body under which the CP is registered as professional. As part of an agreement between the JSE, SAMREC and the relevant statutory bodies, the various stages of the review process of reports submitted to the JSE under Section 12 together with the handling of complaints is expected to follow the routes as indicated in Figure 4.

Future developments

Though all these codes have the same structure, purpose and definitions, which make them, in their totality, one set of general rules, it is now strongly advocated by CRIRSCO that a formal '*International Code*' be compiled[12]. The aim is to have one single code that would incorporate the requirements for public reporting common to all major national and international stakeholders and which would represent the standard for new local codes to follow. That code would be updated by CRIRSCO to incorporate all new relevant aspects and needs felt by the mining and investment confraternity to be worth including from time to time.

For a JORC-type code to have an effective international status, some issues have to be resolved. Of these the most actual and stringent is the need for international recognition of CPs, and perhaps their licensing, together with expanded and standardized responsibilities for professional bodies[19]. While the rules that cover qualification as a CP are generally similar from country to country (acceptable academic qualifications, a minimum of five years' relevant experience, and corporate membership of a professional body) the regulations that govern their appointment and professional status are still radically different. In this regard, there is also an obvious need for consistency in the rules of conduct of CPs and in the disciplinary sanctions that can be applied in cases of negligent or misleading reporting. Currently these range from a mild smack on the wrist to substantial fines and the loss of the licence to practise as a professional, which is equivalent to being struck off the register. Without going into the merits or otherwise of the magnitude of the penalties, there is a clear need for international consistency[18,19]

Another aspect that needs addressing is the mineral exploration results category. For reasons mentioned earlier in this paper, there has been little attention paid to the standardization of language used in the definition and reporting of this category and to the understanding of the transition to inferred mineral resources[20]. The continuous consolidation among major mining companies in many cases has resulted in the attendant scaling back of in-house exploration capability. As a result, has been a proliferation of small- to mid-cap exploration companies and there has been an increased reliance on these to produce new quality projects of interest to the majors. By the nature of the exploration business it is more likely that the future potential of discovered deposits be expressed in the form of mineral exploration results or inferred mineral resources than in higher categories of resources. It is essential then, under the prevailing circumstances in the industry, that the mineral exploration results category is properly defined and understood[20]. This would go a long way in covering an aspect of resource reporting that other resource classifications have addressed more extensively and comprehensively.

Other challenges mentionable are the need to define minimum disclosure requirements for risk assessment (H. Parker's personal communication) and the necessity to establish national industry standards in the mining industry and exploration of 'best practices guidelines'[14]. The latter's natural spin-off is the development of national valuation codes. Canada and Australia have developed valuation codes which are known as the CIMVAL and VALMIN respectively while South Africa is in the process of establishing its own[21]. Regardless of the essential and invaluable benefits to transparency and professionalism in the reporting of information to the investors, these codes will have to seem to be not too prescriptive in order not to adversely affect the output of experienced CPs and the willingness of the mining companies to comply.

The case of Australia is indicative. Though the VALMIN Code is highly regarded internationally, it does not have the formal acceptance that the AusIMM would like[22]. While the VALMIN Code document lists bodies supporting the Code, the degree of support varies quite widely. Apart from the AusIMM, only one or two major accounting firms demand that the VALMIN Code be followed in reports that it commissions[22]. The moderate impact of such Code is also emphasized by the fact that it has not been adopted by organizations such as the Minerals Council of Australia (MCA), the Australian Institute of Geoscientists (AIG), the Australian Stock Exchange Limited (ASX) or the Australian Security and Investment Commission (ASIC)[22].

Conclusions

Three groups of codes for reporting mineral resources and mineral reserves have reached prominence over the past 30 years. All of them were developed to address specific needs at a global super-national level or in order to conform to local legislations when reporting to government or to provide some protection for the mining industry and its shareholders. They are all well suited to address the particular needs they were developed for but none of them can be considered to be truly international. Currently there is a stringent need to regulate the reporting of resources and reserves at an international level to investors primarily because of the globalization of the mining industry. The consolidation of the various national JORC-type codes into one code has been advocated as a possible solution. However, the relevance of such a code might be difficult to assess because of significant differences in national legislation. The first step toward the cross-border liberalization of reporting and financing, if not necessarily toward an international code, would be the reciprocal recognition of competent persons, which is currently strongly being pursued by the major mining countries in the Western world.

Acknowledgements

The author would like to acknowledge the following people for critically reviewing the manuscript and/or professionally advising on the matter of codes: Dr J.-M. Rendu, Dr H. Parker, J. Postle, Ms Deborah McCombe, Ms Sonja Felderhof, W. Vaughan, Dr G. Riddler, Dr Isobel Clark, N. Weatherstone, N. Miskelly OAM, P. Stephenson, Prof. A. Subelj, Prof M. Denisov and Dr K. Kavun of the VIEMS Institute of Moscow, Prof. Slav Slavov and Dr D. Kelter of the UN Geneva, R. Dixon and A. Macfarlane. A special word of thanks to my son Fernando for editing the English.

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