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International Mineral Asset Valuation Conference 2025

Navigating Mineral Asset Valuations in an Uncertain Future

Abstract Book

1-3 October 2025

The Maslow Hotel, Sandton

THE SOUTHERN AFRICAN INSTITUTE OF MINING AND METALLURGY JOHANNESBURG 2025

International Mineral Asset Valuation Conference 2025

Navigating Mineral Asset Valuations in an Uncertain Future

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S114 **Digitalization in Mining Conference 2018**

S115 **Diamonds – Source to Use 2018 Conference 2018**

S116 **The 9TH Southern African Base Metals Conference 2018**

S117 **Geometallurgy Conference 2018**

S118 **Mine Safe Technical Conference and Industry Day 2018**

S119 **ASM Conference 2018**

S120 **4TH Young Professionals Conference 2018**

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S123 **Mine Planner's Colloquium 2019**

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S134 **Diamonds - Source to Use - 2021 Online Conference 2021**

S135 **WorldGold Online Conference 2021**

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Organising Committee

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FOREWORD

Navigating Mineral Asset Valuations in an Uncertain Future

I am delighted that you have all taken the time to attend this conference. We have brought together international experts, practitioners, academics and decision-makers from both the mining and finance sectors to discuss and debate mineral asset valuation approaches in the context of our increasingly uncertain and rapidly changing world.

Our familiar free market system may well be dying as a result of this period of global transformation, but the mineral resources sector continues to offers enormous opportunity, albeit in the face of huge challenges. We are experiencing separate camps and the emergence of multiple pricing markets because of:

- ongoing technological progress;
- political agendas behind changing economic forces;
- ideological stances instead of transactional engagements; and
- different perceptions around the "rules of the game" with respect to efficiency, safety, environmental stewardship, and social responsibility.

I've heard countless times that "value lies in the eye of the beholder", and we need to accept that mineral asset valuations cannot only be derived through the eyes of the West. Our values are not universal and so our perceptions around the risk / reward trade-off are unlikely to be the same.

Uncertainty results when these "rules of the game' are unclear. We should all listen with an open ear if we are to test our prevailing mindsets and inform ourselves so that we can level the playing fields "so to speak".

This may then enable us to deliver more meaningful mineral asset valuations in a truly international context. Global alignment will not happened if we simply forge ahead in isolation. We need open dialogue and a shared commitment to worldwide collaboration.

This conference is designed to do exactly that and I welcome you all and look forward to an engaging couple of days. I trust that we will question the Status Quo and consider new ideas that may contribute to improved alignment across our internationally turbulent waters.

A workshop has been arranged for the day prior to the official commencement of the conference to explore the role of IMVAL. It will be hosted in the morning by Keith Spence, the Chairperson of IMVAL, and then in the afternoon by Tania Marshall of SAMVAL.

Finally, I wish to sincerely thank the organising committee, our keynote speakers, presenters, reviewers, sponsors and everyone else involved in making this conference a success. Thank you for being part of these discussions.

Secretariat:
Gugu Charlie (SAIMM)
Camielah Jardine (SAIMM)
Nazli Mamdoo (SAIMM)
Gcina Matsoyane (SAIMM)

V.G. Duke
Conference Chairperson, Partner – Sound Mining

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Conference Chairperson

Vaughn Duke

Partner
Sound Mining

Vaughn Duke graduated from Wits in 1986 with a B.Sc. Mining Engineering and later with a Master's in Business Administration from the Gordon Institute of Business Science (GIBS) (University of Pretoria).

After moving to Zimbabwe in 1987, he joined the Cementation Company (Zimbabwe) Ltd to was responsible for managing a 900m deep shaft sinking contract at a gold mine and later a larger civil tunnelling contract for the military in Darwendale.

Vaughn's marriage in 1989 saw his return to South Africa where he joined Anglo Vaal to work at its Hartebeesfontein Gold Mine. He progressed through the ranks on the mines and was transferred to head office in 1996. On the demise of AngloVaal in 2004, Vaughn established Sound Mining Solution (Pty) Ltd, a mining consultancy, which is now well established.

Vaughn has over 35 years' experience in the mining industry. He is a recognised Project Management Professional (PMP) and a registered Professional Engineer (Pr.Eng.) with the Engineering Council of South Africa (ECSA). He is a Fellow of the South African Institute of Mining and Metallurgy (SAIMM), has served his term as President of the institute and now remains involved with Council and various committee meetings. He chairs the SAMVAL committee considering updates to the South African Mineral Asset Valuation Code (SAMVAL).

Andrew John McDonald

Principal Engineer
SRK Consulting (South Africa) (Pty) Ltd

Andy McDonald has been responsible for engineering studies of mineral projects, due diligence audits of mining operations, valuations of mineral properties and compilation of public reports for the major stock exchanges over the past 25 years. These cover a range of commodities – PGMs, Au, Mn, Cr, ferrochrome, base metals, diamonds, iron ore, coal, phosphate, uranium, and industrial minerals. He has also acted as Technical Advisor for financial institutions monitoring construction progress and funds drawdown during this time.

He is registered as a Chartered Engineer through the Institute of Materials, Minerals and Mining in London and is a Fellow of the SAIMM.

He was the Chairperson of the SAMCODES Standards Committee for 2022 to 2023.

He was the Chairperson of the SAMCODES ESG Working Group from Nov'21 to 2024 responsible to compile recommended ESG disclosure additions to the SAMREC and SAMVAL Codes.

He is a member of the JSE Readers' Panel and SAMVAL Working Group.

Keynote Presenters

Bruce Williamson

Chief Investment Officer
Integral Asset Management

Following seven years' of deep level mining experience in South African gold mines, Bruce has worked in the South African stockbroking and asset management environment since late 1981. He has a widespread understanding and knowledge of corporate South Africa with widespread business and institutional contacts. Following 18 years' of work as a mining analyst, he held posts of head of research, consultant and lead fund manager. In June 2016, he was one of the founding directors of Integral Asset Management, where his main responsibility is Chief Investment Officer.

Bruce is a Member of the Investment Analysts Society of South Africa (IASSA) and is the IASSA representative on the SAMCODES Standards Committee.

Gordon Smith

Professional Engineer

Gordon is a registered Professional Engineer, an Honorary Life Fellow and Past President of the Southern African Institute of Mining and Metallurgy with academic, industry technical and managerial qualifications. Gordon has extensive experience in the field of business leadership, strategic planning, operational management, business start-ups, feasibility studies, mineral property valuation, prospect evaluation, mine design and planning, rock mechanics, mine economics, risk management, techno-economic evaluation and project management, with an emphasis on systems analyses and optimization, across a variety of precious metal, base metal, ferrous metals, chrome, diamond, semi-precious stone, and coal operations. Following retirement from the Technical, Safety and Sustainability Executive role at Anglo American Platinum Ltd in late 2020 he conducted carbon neutrality related capital project investment assurance reviews across Anglo American plc operations globally, before transitioning to an independent minerals industry advisor and non-executive director in 2024. Gordon serves on several company Boards and has been associated with the University of the Witwatersrand, School of Mining Engineering as an Associate or Adjunct Professor since 2014.

Kobus van der Wath

Co-Founder
Andaman Partners

Kobus is a Co-Founder of ANDAMAN PARTNERS. He has lived and worked in Africa, Europe, Asia, Australia, the Middle East and globally for over 30 years and is currently based between Thailand, China and Australia.

Before ANDAMAN PARTNERS Kobus founded Axis Group International where he served as CEO for 22 years. Axis Group provides global procurement and international market access solutions. The company was acquired and is now part of DP World.

Before founding Axis Group (and The Beijing Axis), he was Head of Investment Strategy and Global Market Research for Asia Pacific for Standard Chartered Bank Plc. Prior to that he was a Senior Strategy Consultant with the Boston Consulting Group in Asia. In his early career he was an Emerging Market Investment Strategist in London; a Treasury Economist with Standard Merchant Bank in Johannesburg; and an Economist with the South African Reserve Bank in Pretoria.

He holds an MBA from INSEAD in France; a Master of Business (I.T.) from Curtin University School of Information Systems in Australia; a BCom Honours degree in Finance & Investments from the University of South Africa; and another BCom Honours degree in Economics & Quantitative Economics from the University of Johannesburg in South Africa. His undergraduate BCom degree is in Economics & Industrial Psychology. He has done executive programmes at London Business School (Strategic Management) and INSEAD (International Management Programme).

Shaun Barry

Principal Consultant (Project Evaluation)
SRK Consulting, Australia

Shaun has more than 30 years' experience in mining, exploration and quarry valuations, mineral economics, minerals marketing and geology.

In his corporate advisory and business development roles, Shaun provided independent expert reviews, valuations, due diligence and optimisation mine studies while working for InSitu Advisory, SLR Consulting, Xstract Mining Consultants and Anglo Coal. In his marketing roles, Shaun contracted sales of alumina, bauxite, copper, cobalt, chrome ore and other commodities while working for Rio Tinto and Anglo Platinum. He also negotiated logistics solutions for platinum group metals and calcined bauxite projects. Shaun worked as a mining equity analyst on the Johannesburg Securities Exchange, and as a mineral economist and mine geologist in South Africa.

Shaun is a full time employee of SRK Consulting, a Member and Chartered Professional of the AusIMM and a Member of the Royal Institution of Chartered Surveyors (RICS), as well as a RICS Registered Valuer.

Clinton Birch

Snr Lecturer
University of the Witwatersrand

Clinton Birch has been employed at the University of the Witwatersrand since 2011 as a Senior Lecturer, delivering courses on Mineral Resource Management and Mine Financial Valuation to both BSc and MSc students. He also teaches Business Planning Principles, Geological Modelling, and Mine Valuation to students in Advanced Mineral Resource Management and Mine Planning. Clinton provides guidance to final-year students on their Mine Design Projects, with a particular focus on mineral reserve statements. Before entering academia, Clinton worked as a Resource Geologist in Angola, specializing in phosphate deposits. He previously held roles in the gold mining sector, including Senior Mine Geologist and later Ore Resource Manager at Harmony Gold Mine. His professional experience spans gold, platinum, phosphate, and base metal exploration and mining.

Clinton has published 20 peer-reviewed journal and conference papers on various topics and has supervised 16 MSc projects to date. His PhD research at the University of the Witwatersrand focused on the relationship between South African royalty and gold tax regimes and the optimization of cut-off grades in narrow tabular gold deposits.

Clinton is registered with SACNASP as a natural applied scientist and is a member of the SAIMM.

Valuation of damages in international arbitration cases

H. Rosen
Secretariat, Canada

Mineral exploration, development, and production properties are large complex investments that depend on cooperation with host nations, their regulatory environment, as well as the laws governing the exploration and exploitation of minerals in the host country.

Investors make investments in host countries based on this framework, with the expectation that their efforts will lead to positive cash flow and an increase in the value of their investment.

Investments that are made in host nations are protected by investment treaties between the investors and the host country. When an investor feels that their investment has not been afforded the treatment it deserves under the treaty, they can seek redress through International Arbitration.

The presentation will do a global scan of several valuation disputes and arbitration results, compensation and settlements. These will include projects in Latin America, Asia and Africa at various stages of development.

Howard Rosen

Managing Director
Secretariat, Canada

Howard Rosen is a Managing Director at Secretariat Advisors (Canada) based in Toronto. He is a Chartered Professional Accountant (CPA/CA), a Chartered Business Valuator (CBV), a Qualified Valuator under the Canadian Institute of Mining's Valuation Standards and Guidelines (CIMVAL), and a member of the CIMVAL Committee. Howard has over 40 years' experience of advising on all aspects of business valuations, damages quantification, and corporate finance related matters. He has acted as an adviser to private and public companies, regulatory bodies, and all levels of government on a wide variety of industries. His work experience covers assignments across North and South America, Europe, the Middle East, Africa, and Asia. Howard has testified in damages quantification and valuation matters on over 200 occasions. Howard has acted as court appointed administrator, monitor and inspector and sat as a member of an Arbitral Tribunal and sole Arbitrator. He is the co-author of two texts, a number of chapters and articles on the quantification of economic damages and has lectured extensively to professional interest groups. Howard has acted as instructor at the NITA and FIAA Expert Witness Trial Practice Programs, the MIDS Program at the University of Geneva, and as an MBA instructor at York University's Schulich School of Business in Toronto. Howard has been listed by Lexology as one of the leading damages and valuation experts in litigation and international arbitration every year since the inception of the list in 2011, and is currently included in 9 key listings, including Global Elite Thought Leader. Howard has also acted as advisor on transactions in a wide variety of businesses, for both public and private equity investors, conducting strategic due diligence, valuations and deal structuring for both buyers and sellers. Howard has advised independent committees of boards of directors on non-arm's length transactions and has also acted as the chair of independent committees of boards of directors for assessing the "fairness" of transactions.

IMVAL template: A critical analysis of the first 10 years of existence, adoption, success, challenges and its future

G. Njowa[1], A.N. Clay[1], C. Musingwini[2]
[1]Ernst & Young Advisory Services (Pty) Ltd, South Africa
[2]University of the Witwatersrand, South Africa

For over a century, most companies in the minerals industry have operated across multiple geographical, regulatory or legislative jurisdictions. This trend has been further intensified by the globalisation of the world economies in recent decades. Such cross-jurisdictional engagement necessitates that information on mineral assets or properties be reported in a standardised manner to ensure a consistent understanding regardless of the jurisdiction. The standardisation of minerals reporting codes by the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) established a comprehensive framework for defining exploration results, mineral resources and mineral reserves. Once mineral resources and mineral reserves are identified through this framework, it provides a solid basis for the subsequent valuation process which necessitated the development of an International Mineral Asset Valuation (IMVAL) template for harmonising national valuation codes. The template ensures common understanding, interpretation and valuation of mineral assets or properties. It is important to understand an extractive entity's minerals or oil and gas resources and reserves because they are the most significant assets, or among the most significant assets of those entities as they are a source of future cash flows (IASB, 2010; Njowa and Musingwini, 2018). This paper will explore the brief history on the development of the CRIRSCO template, critical events in the global mineral industry and how it led to the creation of the IMVAL template in 2012, after the Brisbane Accord. This timeline will provide some insights into why these global templates are important for the mineral industry, its investors and stakeholders. It will also summarise the progression from the first edition to the latest (fourth) edition. The paper will also critically assess the level of adoption of this template by the major mining countries in the world, as a measure of its success, challenges and its prospects for the future. The paper will also summarise key trends that have been observed as critical success factors in countries that have mineral endowments. Lastly, the paper will propose potential key focus areas that the IMVAL committee could consider as part of the journey in improving global acceptance of the IMVAL template.

Keywords: CRIRSCO Template, Mineral Asset Valuation Codes, Harmonisation, IMVAL Template.

Godknows Njowa

Principal/Partner – Mining Engineer
EY

Godknows has considerable experience in the minerals industry, from mine production, mining research, mine planning and optimisation, management accounting, costing analysis and project feasibility studies of various commodities, including PGMs, Au, Ni and Coal. His mining career started in 2000, at Rio Tinto Zimbabwe's gold mines, where he worked in various capacities. This gave Godknows a solid understanding of mining and the evaluation of mining projects. His key areas of expertise lie in a combination of skills, including technical and financial analysis, mining engineering, financial and management accounting, and corporate governance. Mineral asset valuation, compliance and public reporting of mineral assets for the various stock exchange jurisdictions are his core focus areas. Together with experience in both technical and corporate finance, he has consolidated his expertise in the detailed financial valuation of mineral and mining projects and have completed a PhD in mineral asset valuation and financial reporting..

Valuation of early-stage exploration nickel laterite project in central Sulawesi, Indonesia using the artificial neural network and bat algorithm

V. Veriyadi
PT. GRabuma, Indonesia

This paper presents a methodology for valuing property during the early stages of exploration, with a specific focus on a nickel laterite project in Central Sulawesi, Indonesia. The primary variables used to assess this property are geological uncertainty and exploration costs. Geological uncertainty is quantified based on mineral system probabilities, which adjust the geological factors that can influence the property's value. In contrast, exploration costs represent the inherent value, as determined in accordance with International Financial Reporting Standard (IFRS) 6. The inherent value of the property is converted into potential value, which is essential for determining the net present value (NPV). This calculation considers revenues, initial investment, costs, and a risk-adjusted discount rate (RADR). Revenues are derived from monthly nickel prices and the sale of products. The discount rate comprises the risk-free rate, market risk premium (MRP), project risk, and country risk premium (CRP) of Indonesia. Predictions for nickel prices and market risk premium are based on historical monthly data from May 2003 to December 2024, which are simulated using artificial neural networks (ANN) and the bat algorithm (BA) to optimize the net present value (NPV). The results indicate that both ANN and BA outperform the Monte Carlo simulation in terms of performance.

Keywords: project valuation; early-stage of exploration; artificial neural network; bat algorithm

Veriyadi Veriyadi
Lecturer
Universitas Islam Negeri Syarief Hidayatullah Jakarta

Over 20 years involving as a professional in mineral resource estimation and geostatistics. Currently, just submitted the journal for grade estimation using the artificial neural network (ANN) and the Archimedes Optimization Algorithm (AOA). Over 12 years working for mine valuation from exploration through production using the market., cost and income approaches. Involving the net present value, decoupled NPV and real options in valuing the mineral properties including managerial flexibility. Providing consulting, training and advice for energy & metal price forecasting using quantitative methods from econometric, time-series stochastics, machine learning and hybrid models.

The journey to unlock mineral resource potential through the implementation of internationally accepted reporting code(s) in Mongolia

S. Purevgerel[1,2], E. Battumur[3]
[1]Mongolian Professional Institute of Geology and Mining, Mongolia
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The Mongolian mining industry is a vital contributor to its national economy. Since the 1990s, Mongolia has transitioned from a centrally planned economy to a free market system. Therefore, international reporting codes/standards for exploration results, mineral resources and ore/mineral reserves and their associated classifications have been introduced and updated several times. The key purpose of their implementation being government reporting, planning, approvals, and database registration; and to better inform investors and their professional advisors to attract investment in financial and capital markets. There are some challenges for local regulators and other stakeholders in understanding and implementing the principles (transparency, competence, materiality), modifying factors and requirements of reporting codes/standards in the Mongolian mining industry. Within the country, there are many mineral projects that are underdeveloped at various stages requiring significant capital investment to progress. For Mongolia, the implementation of internationally accepted standards will provide significant opportunity to earn the trust and confidence of global investors, enhance its reputation in the world market, and access a broader financial support. Technical reports (for public exposure) prepared in accordance with the relevant code/standard can be a critical basis for a further technical assessment/evaluation and mineral valuation. Therefore, the Mongolian Mineral Asset Valuation code (MONVAL, 2021*) was initially developed, and which is linked and related to the Mongolian Reporting Code (MRC, 2014). This paper will present the challenges and opportunities of adopting best practice aligned to the international reporting system for Mineral Asset Valuation in Mongolian financial and stock markets. Also, Mongolian reporting standards and guidance for mineral resources/reserves in the mining sector will be also discussed.

Keywords: reporting codes, mineral valuation, technical assessment, mineral resources/reserves, reporting standards, challenges, opportunities, Mongolia.

Saranchimeg Purevgerel

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Saranchimeg Purevgerel has over 19 years' experience in the resource development, exploration, mining and investment sectors.

She has worked on various projects and deposits including copper, gold, coking coal and iron ore. She has contributed substantially to develop The Mongolian Mineral Valuation Code (MONVAL code) for the Technical Assessment and Mineral Valuation reporting. She is currently a Director and Technical consultant of MSA Global LLC.

She has contributed to develop the Khushuut Coking Coal Deposit at Western Mongolia, participating in a 50,000-meter drilling programme to support resource development between late 2006 - 2011. This resulted in the reporting of a Mineral Resource in accordance with The JORC Code for the HK listed "Mo En Co" company. Also, she has worked with international investment companies in Mongolia reviewing and undertaking due diligence on exploration and mining projects for investment in Central Asian countries. Between 2011 and 2015, she worked as Manager of Geological Services at Quintana Minerals and Asian Pacific Investment and Advisory Group (Mongolia). In 2017, she worked for the geology and mining consulting company in Australia. Recently, she has contributed to mineral projects across mineral exploration, technical assessment/evaluation, resource/reserve auditing, board management support and mineral valuation, CAPEX review, royalty assessment, mineral capital investment decision and financial and operational cash flow modelling.

She has graduated with a B.Sc. Degree in Geology at the National University of Mongolia in 2002 and obtained her MBA in Mining Management at Mongolian University of Science and Technology in 2011. She has graduated MSc in Mineral Economics at Western Australian School of Mines, Curtin University in 2018 with sponsorship from the Australian Awards Scholarship, Australian Government.

The lead time to production: An example from Altamin's Gorno zine deposit in the Cisalpine Alps

M. Mullins
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With the current global focus on critical and strategic raw material self-sufficiency, the lead time from discovery to production is receiving renewed attention. This is particularly pertinent to new mines in the OECD countries of the USA, Canada, Australia and the European Union. The lead times vary greatly from country to country,

The increasing demand for critical minerals to deliver decarbonisation objectives is being hampered by the time taken to develop projects, especially in the OECD. The lead times vary greatly and depend on a number of factors.

An S&P study in June 2023 of 127 mines from 2002 to 2023 reports an average time of 15.7 years from discovery to commercial production, with a range of six to 32 years, and the lead times being greater in OECD countries vs those in Africa.

Since 2002 only three mines have come online in the USA, with the average lead time being 29 years. Clause 3.11 of the 2016 edition of the SAMVAL Code specifies that the valuation date of the valuation shall be given, because assumptions, premises, and forecasts used in the valuation are only valid at a specific point in time.

The prime reason given for the long lead times from exploration to production is for permitting requirements, particularly for environmental permitting. A number of valuation assumptions would change during the permitting period. Whilst a valuation can be updated to reflect these changes, there is a certain length of time under which fresh assumptions would need to be developed. The codes are silent on the acceptable elapsed time. Provided that no further drilling or that the resource and/or the reserve estimates have not been updated, the key technical and economic assumptions that would need to be updated, per valuation approach, are shown below:

- Historical cost approach – updated for CPI
- Comparative / market approach – metal / commodity prices and exchange rates
- Discounted cash flow approach – capital costs, operating costs, metal / commodity prices and exchange rates.

This paper examines the valuation of deposits through the lens of lead times. The example to be used is Gorno, an advanced-stage brownfields mine redevelopment with well-defined zinc, lead and silver mineralised resources located in the Lombardy region of northern Italy. The project has a rich legacy of historic mining activity which provides significant existing infrastructure. In fact, mining many have dated back to Roman times.

Gorno is 100% owned by Altamin, an ASX-listed (ASX: AZI) mineral company focussed on base and battery metal exploration and brownfield mine development in Italy, with two 100% owned mineral projects and four licences under application.

Until 1982 the historic Gorno underground zinc mine was owned and operated by SAMIM (a state-owned company and part of Ente Nazionale Idrocarburi (ENI)) prior to a unilateral decision to close all SAMIM-owned metal mining in Italy to focus solely on oil and gas.

Drilling by Altamin under an Exploration and Mining Licence since 2015, together with an analysis of historical information, has resulted in the estimation of Indicated and Inferred Resources, and the completion of a scoping study. By the 1990s Italy had lost its leading position in base metals production in Europe, and in fact no new hard rock mine has been developed in the country for at least the past 40 years.

In 2022 Altamin was the subject of a hostile takeover by its major shareholder, and Snowden Optiro was requested to perform an independent valuation of the company, of which the Gorno project comprised the majority of the value.

Gorno comprised areas defined as Mineral Resources, areas where exploration targets had been delineated with limited exploration results, and prospective areas with no exploration. All three areas were valued, with appropriate discounts applied.

In addition, the deposit was valued using a historical cost approach, adjusted by a prospectivity enhancement multiplier.

Snowden Optiro determined the market value of the Altamin's Gorno mineral assets to be between US$41 million and US$104 million, with a preferred value of US$68 million (Table 1.1). As expected, the majority of the value is found in the area underpinned by defined Mineral Resources (71%) and by exploration targets (28%).

A check valuation for Gorno and for the other exploration areas has been based on the Multiple of Exploration Expenditure approach. The €17.2 million Gorno exploration spend to April 2022 has been modified to produce the valuation as shown in Table 1.2.

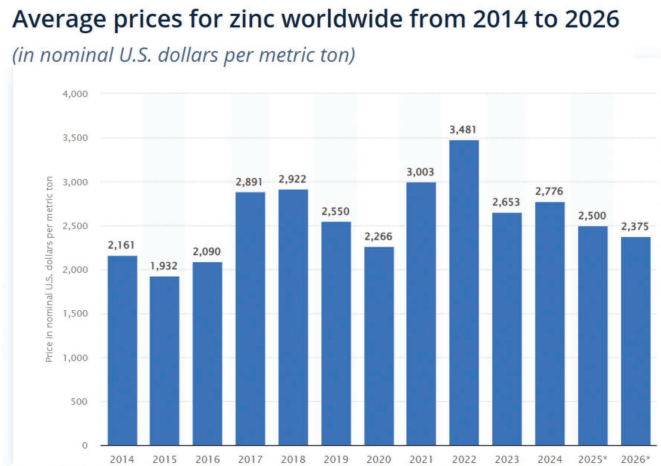
Table 1.1: Valuation of Altamin's mineral assets as at 26 May 2022

Project	Region	Commodity	Permit Status	Project Development Status	Mineral Resource Status	Low	High	Preferred
Gorno - Monica Mining Licence	Lombardy	Zn/Pb/Ag	Renewal under application	Project Development	Mineral Resources	31.6	71.2	48.2
Gorno - Monica Mining Licence	Lombardy	Zn/Pb/Ag	Renewal under application	Advanced Exploration	Exploration Targets	9.0	32.0	19.0
Gorno - Monica Mining Licence Val Vedra & Arera	Lombardy	Zn/Pb/Ag	Renewal under application	Exploration	Additional Area	0.1	0.2	0.1
Gorno - Monica Mining Licence Fortuna	Lombardy	Zn/Pb/Ag	Renewal under application	Exploration	Additional Area	0.1	0.1	0.1
Gorno - Cime Exploration Licence - Outside Mining Lease Application	Lombardy	Zn/Pb/Ag	Granted to 5 Jul '23 and renewable for a further 3 years to 5 Jul '26	Exploration drilling	Granted to 5 Jul '23 and renewable for a further 3 years to 5 Jul '26	0.1	0.1	0.1
Subtotal Gorno						**40.8**	**103.7**	**67.5**

Table 1.2: Check valuation for Altamin mineral assets using the Multiple of Exploration Expenditure approach

Altamin Asset	Cost - US$	PEM - Low	PEM - High	Value (low) - $M	Value (high) - $M	Value Preferred - $M
Gorno Zin Project	18.7	2	5	37.4	93.5	65.5

Both the zinc and lead prices are currently (September 2025) trading at a lower price to that used at the time that the valuation was undertaken (May 2022). However, mine development has been held back by the extensive permitting time needed to permit a new mine in an OECD country, and it is currently 10 years since modern exploration began.



Source: Statista

Conclusions

The assumptions used at the time of a valuation exercise may not be valid at a date in the future, and care must be taken when quoting a historical valuation number or range. This is particularly important when one considers the long lead times from exploration to production, particularly with extensive permitting requirements in OECD countries.

Matthew Patrick Mullins

Snowden Optiro
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Matt is a London-based mining professional with 45 years of experience in the mining industry. He has held senior positions in Snowden Optiro, Arcelor Mittal, BHP, Barrick and Goldfields. Matt is a Competent Person/ Valuator in most major commodities and has experience of working on projects, operations and due diligence investigations in most major commodities and in many key geological terrains around the world.

He has been a Chairman of the SAMREC and SAMVAL Committees and remains active in governance and reporting circles. He is a past President of the Geological Society of South Africa and currently chairs the Ethics Committee of the AusIMM.

Matt is currently and Executive Consultant with Snowden Optiro.

Rethinking mine valuation through regenerative closure: From long-term liabilities to latent value

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The global minerals industry stands at a crossroads, where the prevailing model of mineral asset valuation fails to adequately account for the long-term liabilities or social-environmental costs associated with mine closure. Unfunded or underfunded rehabilitation obligations present a compounding challenge to financial sustainability, social licence, and environmental stewardship. Despite regulatory frameworks mandating closure planning, most financial models treat closure as a technical afterthought, often reducing complex, long-tail obligations to a single line-item provision. This approach obscures the true economic risks and forecloses opportunities for value creation in post-mining landscapes.

This paper proposes a transformative shift in mineral asset valuation practices by integrating long-term closure liabilities into the core of investment decision-making and operational planning. It explores an alternative closure management approach grounded in systems thinking, regenerative economics, and structured finance—framing closure not as an end-state, but as a pivotal transition into a resilient, climate-aligned post-mining future. At its core, this model redefines liabilities as latent assets, capable of delivering ecological restoration, renewable energy, and social impact returns when appropriately conceived, properly planned and financed for execution.

The paper presents a scalable operational model supported by two key pillars:

An equity-based environmental closure fund and a specialised mined land estate custodian.

Under a stewardship agreement, mining companies can transfer impacted land to this entity for reclamation, unlocking early bond release and offloading long-term exposure. The proposed model is designed to unlock patient but sustainable income streams by incorporating the potential for a degree of revenue predictability.

This liability-shedding approach would be further strengthened by a constructive social partnership programme, ensuring inclusive participation of community entrepreneurs and the potential for local economic diversification and less post-closure social disruption.

The model will enable mining companies to realise additional value from brand enhancement because of increased transparency, higher investor confidence, and improved accountability to stakeholders.

Crucially, this new consciousness is likely to challenge mining professionals to abandon the linear extractive logic of the past and embrace a regenerative paradigm. As Albert Einstein warned, no problem can be solved from the same level of thinking that created it. To truly solve the mine closure equation, we must evolve our thinking for mineral asset valuations that recognise land not merely as a risk to be managed, but as a living system to be reimagined, and restored or renewed. The paper concludes by reframing liabilities as opportunities.

Fanus van Wyk

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Fanus van Wyk is the CEO and co-founder of Agreenco, an environmental services company specializing in sustainable mine closure and environmental engineering. With over 25 years of hands-on experience, he is well recognized for his thought leadership in environmental rehabilitation, integrating sustainability with practical, on-the-ground solutions. Fanus drives innovation through unique and long term focussed design and execution of feasible rehabilitation and end-land use projects. He views tailings facilities, mine residues, discard dumps, artificial riverine systems, and backfilled open-pits as valuable resources with significant potential in the circular economy. His business case approach towards the synergies offered by the mining, industrial, green energy, water, and agricultural sectors can unlock achievable sustainability solutions. Fanus envisions large-scale, rehabilitated landscapes founded on scientific rigour and specialised land management that will deliver sustainable development goals and ensure long-term value for stakeholders and future generations.

Gold property transaction values and gold price (2012-2024)

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SLR Consulting Ltd. (SLR) has tracked transactions on gold properties worldwide from 2012 to 2024 (to 31 August). We have compiled data on 842 transactions reported in the proprietary SNL database to which SLR subscribes. Key parameters are (1) contained ounces of gold equivalent (oz AuEq) in all categories of mineral resources (including reserves) at the date of the transaction, (2) property values as reported in the SNL database adjusted to a 100% interest if the transaction is for less than 100%, (3) stage of exploration and development, and (4) country where the gold property is located.

For comparative purposes, transaction values for each property are expressed in US dollars per ounce gold equivalent ($/oz AuEq or $/oz).

Values as expressed in $/oz are significantly higher for producing properties than for non-producing properties, as expected (Table 1). Note that property values and contained ounces are also significantly higher for producing properties than for non-producing properties. Because of these differences, each type of property is treated separately in the following discussions.

Table 1. Summary Data for Non-Producing and Producing Properties Stage of Property

Stage of	$/oz AuEq		Property Value $M		Contained oz M		
Development	Average	Median	Average	Median	Average	Median	N
Non-Producing	27	12	25	4	1.3	0.4	719
Producing	58	36	190	48	3.1	1.7	123

Figure 1 shows the number of transactions annually for 2012 to 2024 (to 31 August) for (a) non-producing properties and (b) producing properties. Average annual gold price is also shown for reference.

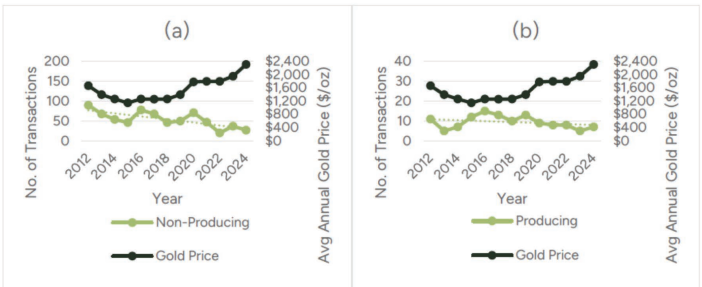

Figure 1. Number of Transactions by Year for (a) Non-Producing and (b) Producing Properties

In Figure 1(a), the number of transactions on non-producing properties has decreased overall from 2012 to 2024. This downward trend is particularly notable from $78/oz in 2016 to $27/oz in 2023, when gold prices increased substantially from approximately $1300/oz to $,300/oz over the same period. Figure 1(b) also shows a decrease in the number of transactions for producing properties from a peak of 15 in 2016 to 7 in 2024. The contrast between the opposing trends in number of transactions and gold price is particularly notable in approximately the last five years.

Figure 2 charts the annual average and median $/oz AuEq values of transactions from 2012 to 2024 (to 31 August) for (a) non-producing properties and (b) producing properties. Average annual gold price is also shown for reference.

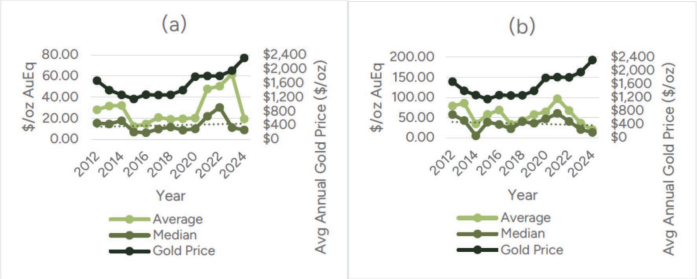

Figure 2 Average and Median $/oz AuEq Values by Year for Transactions on (a) Non-Producing and (b) Producing Properties

There are large differences between the average and median values, more so for non-producing properties, in years when the average annual $/oz value is relatively high. This is due to a small number of very high $/oz values, typically greater than $100/oz that influence the average values more than the median values. For this reason, the median is considered to be a more consistent measure of the overall annual transaction values.

Trendlines are shown in Figure 2(a) and (b) for the annual median $/oz AuEq values. The trendline for non-producing median $/oz values is relatively flat overall but shows a decrease from $30/oz in 2022 to $19/oz in 2024. This contrasts with an increase in the gold price from about $1800/oz in 2021 to over $2300/oz in 2024 (to 31 August). The same effect is seen in Figure 2(b), where the overall trend of median $/oz values for producing properties is relatively flat, but there is a decrease from $$61/oz in 2021 to $20/oz in 2024. This again contrasts with an increase in gold price from about $1800/oz to more than $2300/oz over the same period.

In summary, for both non-producing and producing gold properties, the annual number of transactions decreased from 2012 to 2024, especially over approximately the last five years as the gold price rose dramatically. Similarly, in recent years, the annual median $/oz AuEq values decreased as gold prices increased substantially. The reasons for this counter-intuitive behaviour are unclear at this time.

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Grant A. Malensek is a Managing Principal Mining Engineer with 25 years' experience in the mining industry. Prior to joining RPA, now with SLR, Mr. Malensek was a Mineral Project Evaluation Consultant for a large engineering firm where he project managed fatal flaw, due diligence and Independent Engineer reviews for equity and project financings. He also prepared technical-economic models, project finance models, mineral property and mineral project valuations, and valuations for the International Centre for Settlement of Investment Disputes (ICSID). Grant's consulting experience includes Feasibility and Prefeasibility Studies, Preliminary Economic Assessments, capital cost estimates and reviews, mine strategy, and options analysis and project evaluations in connection with mergers and acquisitions.

Commerciality in oil and gas and economic viability in mining: What's the difference and implications for valuation

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In the IASB Extractive Industries Issues paper of 2000, the audit professionals asked deep questions about the differences between the minerals industry and oil and gas. In an over-500 page seminal document they explored the differences in mineral resource estimation, accounting for them on the balance sheet and in the financial statements. Although there was detailed debate about revenue recognition, the differences between exploration and development and cash flow analysis for Fair Value calculations as a key topic was "Why are these industries treated differently?" This paper illustrates the differences in the topic of 'commerciality' and how to define the transition from a developmental project to an operating entity. It also recommends that a common principles-based set of criteria should link the oil and gas commerciality concept with the economic viability concept in mining.

Andrew Neil Clay

Independent Advisor

Andrew Neil Clay is a geologist, mineral asset valuator, and executive consultant with nearly five decades of global experience in mining, oil and gas, and financial services. Currently Principal Consultant and Executive Coach with Ernst & Young Advisory Services Limited, he is recognized as a Competent Person and Competent Valuator under international reporting codes.

Andy's career spans field geology in Zimbabwe, senior ore reserve roles at Rand Mines, and founding Venmyn Rand, later Venmyn Deloitte, a globally respected techno-economic consultancy. He has advised on hundreds of transactions across commodities, stock exchanges, and jurisdictions, often providing independent valuations, fairness opinions, and expert witness testimony.

He has played a leading role in developing global reporting standards, including the SAMREC, SAMVAL, and SAMOG Codes, and serves as Chairman of both SAMOG and the AAPG Water Resources Management System initiative. His passion is applying rigorous statistical and financial methods to bring transparency and innovation to mineral asset reporting.

Mining investment in uncertainty

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It is critical for investors to understand the location and nature of the orebody, tonnes/grade distribution, processing and metal recovery, the infrastructure required to access the full extent of the orebody, services and skills required, and obviously the financial assumptions (operating and capital costs). Tax and investment incentives are critical, and governments have increasingly forced miners to take on wider social and community responsibilities.

The question arises whether the Mineral Resource and Mineral Reserve annual reports include sufficient, meaningful information for investors. A major issue for valuation purposes is Life of Mine (LoM) and what access a mine has to available ore-reserves. To this extent the inclusion of underground plans and transverse or cross-section plans are most helpful. Adequate, equipped and supported stope face for immediate mining is critical to maintaining mill capacity. Transverse section plans can greatly assist equity investors in understanding what portion of the orebody can be accessed and what additional capital expenditure is required to support a sufficient LoM. Transverse section plans can also improve investor understanding of the complicated geological issues – dykes, sills, potholed reef, split reef, faults or grade washaways – that miners regularly deal with.

Mining investment in Africa certainly lags the rest of the world; and the situation in South Africa is worse as there has hardly been a new mine developed in the past 25 years. Consider that the number of shares listed on the JSE has fallen by 67% from 808 in 1989 to the current 270, with an additional 45 secondary listings. Of the total JSE listed shares, 40 are in the Basic Materials sector which includes mining and 23 or 58% of the mining shares are secondary listings, indicating the need to go offshore for investor support.

We now are faced with increased global uncertainty/volatility as America's hegemony is challenged. The rise of China and the evolution of BRICS+ is testament to the likely transition from the US-led unipolar world to a multipolar world. No matter how global politics unfolds, energy and commodities are going to be sought after. The proposed merger of Anglo American and Teck Resources adds to the notion that developing large new copper and other mines is near-impossible. Explorers and junior miners need to be very brave in these turbulent times as long-term equity investors have fled, leaving only bankers offering debt and streamers offering quasi-debt. How then can we as valuators and analysts assist in steering companies/projects through the morass of uncertainty?

Two gaps exist in the investment space:

- Education – many of the large pension fund managers and analysts are CAs or CFAs who do not easily understand what happens in an underground mine; and
- Policy - without attractive, competitive government policies, resources will never be exploited. Investment incentives and lower tax rates effectively add to head grade and yield. Primary industries (such as mining) create jobs, not bankers, lawyers or fund managers.

The fund managers should be demanding growth policies from the government so that pension funds can participate in long-term growth opportunities. And SAMCODES members and affiliates should be marketing their skills and services to the pension fund industry. Otherwise, the fund managers will continue to trade shares between each other in the secondary market and no new opportunities are added. That is not a death wish, it is guaranteed death.

Revenue and capital uncertainty in cash flow analysis

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The Income Approach valuation "requires determination of the present value of future cash flows over the useful life of a Mineral Asset" (SAMVAL, 2016). The most common method in this approach is the discounted cash flow, which comprises four money-related sections: revenue, capital costs, operating costs and legislative costs (environmental, social and governance aspects, taxes, royalties, etc.). In this paper, I review the uncertainties associated with the revenue (metal prices) and capital cost components of the cash flow.

Forecast metal prices are all premised on assumptions of future macro-economic and supply/demand conditions. A consensus price forecast is typically the median, or average, of forecasts from multiple sources; what is seldom considered is the range from highest to lowest within those forecasts. Certain jurisdictions require the use of observable inputs (International Financial Reporting Standard, IFRS 13) such as spot or three-year trailing average prices.

The completed construction cost of many mining projects has exceeded the original feasibility study budget by between 50% and over 100%. Inclusion of a contingency of <10% at feasibility study level does not adequately cater for the cost overruns seen in practice.

A valuation derived using the Income Approach is required to specify a preferred value within a range of values. By assessing the degree of uncertainty in the real metal price forecasts and capital estimates, I discuss what should be considered in evaluating the sensitivity of a project to such uncertainties, while presenting a value range that is still meaningful.

Uncertainty in mineral asset valuation from an independent expert viewpoint

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Independent Expert Reports (IERs) play a crucial role in the Australian regulatory landscape, providing company shareholders with often the only independent information available to assess a proposed transaction. These transactions frequently involve control transactions, requiring shareholders to sell or exchange their shares. Consequently, the opinion provided by the independent expert is a key input in their decision-making process. Therefore, the IER must offer an opinion supported by a clear and meaningful explanation of how it was derived.

Valuing a company's mineral projects is a fundamental part of the independent expert's process to determine whether the proposed transaction is fair and reasonable or in the best interest of shareholders. Typically, the independent expert instructs an independent technical specialist to provide a valuation or a technical assessment report in accordance with the VALMIN Code. The valuation approach adopted depends on the maturity of the project being valued. Whether the approach is market-based, income-based, or cost-based, the choice of methodologies and their application must be clearly explained and justifiable.

This paper examines how these practices are implemented, drawing on the author's experience and an extensive study of public reports in the Australian market. It focuses on exploration and pre-development projects and the challenges faced by independent experts in providing shareholders with meaningful information for decision-making.

For exploration and pre-development projects, the independent expert instructs an independent technical specialist to value the project. Due to limited information on exploration projects, there is often a tendency to provide a very wide valuation range, which may be too broad to be meaningful for shareholders. This paper explores how independent experts manage this issue in practice. For pre-development projects, while more valuation approaches are available, there is often a disparity between values derived from different methodologies and between what might be considered technical value and market value. The paper discusses how independent experts navigate these challenges in practice.

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Deal Advisory Partner and Global Natural Resources & Energy Leader
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Sherif is BDO's Global Natural Resources & Energy Leader, a role that encompasses the services BDO provides across the globe to clients in the mining, oil and gas, and renewables sectors.

He has led BDO teams for a number of mergers and acquisitions, and has completed numerous independent expert's reports (IERs) and other special investigation assignments. Having prepared over 750 public IERs and investigating accountant's reports, Sherif is recognised in Australia as a leader in his field.

Sherif's valuation experience covers small, medium-sized, and large listed and unlisted companies across a broad range of sectors, with a focus on natural resources and associated industries. His valuation reports have been required for many different purposes, including transaction support, capital raising, change of ownership, taxation, financial reporting and litigation support. He is highly regarded for his practical problem-solving strategy and attention to detail, both of which are of enormous benefit to his clients within his area of expertise.

He has acted as an expert witness for matters in the Supreme Court of Western Australia, Federal Court of Australia, Family Court of Western Australia, and Singapore International Arbitration Centre. Sherif has also presented on valuations at many industry events and seminars, and has contributed the chapter on independent expert's reports (IERs) in the book Schemes of Arrangement (Federation Press).

Sherif is a CA BV (Business Valuation) Specialist, as recognised by Chartered Accountants Australia and New Zealand (CA ANZ) and received the Meritorious Service Award in 2024 for services to CA ANZ.

Risk and value in exploration and mining development projects

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Over the past decade an increasing interest in critical minerals and strengthening metal prices for some commodities, particularly gold, has seen continued company consolidation and funding for exploration (BDO, 2024). While 2024 was more subdued for explorers compared to the highs of 2021, when the Australian Securities Exchange (ASX) listed 192 new companies raising more than A$10 billion (ASX, 2021), the search for new deposits continues.

Governments such as in Australia and the United States are supporting emerging projects in volatile market conditions for critical minerals to support the energy transition. Risks are high in early project development, and in Western Australia for example, lithium mines have started and stopped, and nickel mines and concentrators have closed. Even in more traditional commodities, investors often don't appreciate the high inherent risk and uncertainty associated with exploration and development of new projects. So how as a valuation community do we effectively communicate these risks and changing markets? And how do we value these opportunities without misleading investors that all projects will be successful?

This paper focuses on understanding exploration risk based on an early study of the probability of exploration successes over a decade in a well-endowed gold environment (Lord et al., 2001). It examines how this low-probability of discovery translates to valuing early exploration-stage properties and the associated range of values to be expected (Lord et al., 2012). The potential pitfalls of a probability-based approach are outlined and what mechanisms can be used to constrain the outcome range are noted, via the application of more than one valuation method.

Advanced exploration properties are also considered, where there is a shift from describing the opportunity of discovery to understanding the risks associated with mining development. At this critical point, the landscape of high-risk investment vs stringent market regulation is relevant. The Australian regulatory framework provides detailed guidance on what forms a reasonable basis and what elements might be potentially misleading to investors.

Some examples of valuing exploration stage mineral assets relating to commodities with high price volatility are covered. Additionally, some analysis and charts will be included to show the ramp-up performance of recent Australian project developments (Fairbairn, 2025).

The overall intent of the paper is to help valuers better describe exploration opportunities and risks, uncertainty and what offers increased confidence at the exploration to development stage of mining investment.

Deborah Lord

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Deborah has over 35 years' experience in the resources sector in a wide range of roles including independent consulting, resource governance, leadership and industry advisory positions. Deborah is Chair of the VALMIN Committee that develops and maintains the Australasian Code for Public Reporting of Technical Assessments and Valuations of Mineral Assets – the VALMIN Code. Deborah worked closely with the Australian market regulators in developing and publishing the VALMIN Code, 2015 Edition and is participating in the current JORC Code update. She was formerly a member of the AusIMM Professional Conduct Committee and her contribution to leadership and achievement in progressing and upholding professional standards was recognised by the AusIMM in 2023 when she received the Presidents' Award, the first female recipient in the 50-year history of the award.

As a Director of VRM, consultants in mineral asset valuation based in Perth, Australia, Deborah's expertise is technical assessment and valuation of exploration to pre-development projects, having worked in this field for more than two decades. She is also a Non-Executive Director of ASX-Listed companies Lunnon Metals (ASX: LM8) and E79 Gold Mines (ASX: E79). She previously worked for the BHP as Head of Resource Governance, managing the assurance and public reporting of Mineral Resources and Ore Reserves across copper, iron ore, coal and potash global businesses within the BHP Group. Prior to that she spent many years with SRK Consulting, Placer Dome and WMC Resources.

Deborah is champion for women in mining, including as an early advocate for flexible working arrangements, and as a mentor in the International Women in Mining program. She is a Fellow of the Australasian Institute of Mining and Metallurgy (AusIMM) and a Chartered Professional (Valuation), a Member of the Australian Institute of Geoscientists (AIG) and a Graduate of the Australian Institute of Company Directors (AICD).

The challenge and opportunity of integrating environmental, social and governance-sustainability metrics into strategic long-term mine planning

G.L. Smith
Minerals Industry Advisor, South Africa

The minerals and metals extractive industry operates at the intersection of multiple ecosystems and society, resulting in mining operations developing as complex adaptive systems (CAS). These systems evolve in response to internal and external influences to exhibit adaptive and emergent behaviours in response to economic, environmental, social, and governance (ESG) factors throughout the life of a mine. These ESG system factors continuously adapt to shifts in regulation, ecological concern, and social dynamics making integration of stakeholder ESG impacts into life-of-mine (LOM) planning crucial. Concurrently multi-generational sustainability expectations will diverge from initial project optimisation assumptions, affecting LOM planning assumptions and closure cost requirements, necessitating scenario-driven, dynamic LOM perspectives. To address these challenges, ESG factors should be effectively integrated into strategic long-term planning tools and processes. This involves identification and quantification of ESG criteria for inclusion as economic modelling attributes to reflect financial impacts of evolving ESG demands over anticipated LOM strategic scenarios. Such an approach offers improved insights into likely operational economic envelopes under diverse scenarios, guiding mineral resource modifying factors, LOM planning, and mine closure strategies.

Are ESG best practices being recognised in mining valuations?

S. Nupen[1], N. Ivory[2]
[1]Deloitte, South Africa
[2]Deloitte, Australia

This presentation will look at whether mining companies that abide by environmental, social and governance (ESG) best practices (either through regulatory requirements or through their own choice) are seeing this reflected in a valuation uplift relative to those that do not employ ESG best practices. In this context, ESG best practice factors include carbon emissions, land usage, biodiversity impacts, water usage, local community impacts and rehabilitation practices.

We will consider how valuations could incorporate different applications of these factors, looking at both the discounted cash flow (DCF) and multiple-based valuation methodologies. This will include considering both revenue and risk aspects of valuations. Under revenue we will consider price premiums (the current lack thereof, and the potential for this to change). Under risk we will consider the various factors that are built into discount rates (and valuation multiples), which could include ESG practices (good or bad), and the potential for discount rate (or multiple) differences to widen even further as the risks increase that future legislation changes through the global supply chain (akin to the EU's carbon border adjustment mechanism) could impose as additional risks on miners who don't adopt ESG best practices.

Our hypothesis at this stage is that ESG best practices are not showing up in the revenue side of valuations as no green premiums are evident in commodity pricing, but they are to some extent showing up in discount rates. We will draw on examples from across the globe to illustrate our hypothesis.

Stewart Nupen

Associate Director | Technical Mining Advisory Lead
Deloitte, South Africa

Stewart Nupen has more than 20 years experience in Mine Production, Geological Modelling, Mine Technical Systems, Mineral Resource Evaluation, Mineral Resource / Reserve reviews and technical Due Diligence. Stewart has spent time as a production geologist on deep-level gold mines, in the Mining Software Industry and as a Director of a Mining Advisory Firm – this has given him an in depth understanding of the entire mining value chain.

Stewart has advised on Mineral Resources for Project Development, undertaken Mineral Resource Evaluation and authored Competent Persons Reports and NI 43-101 reports in gold, platinum, lithium, uranium, manganese and iron ore. Stewart currently leads Deloitte's Technical Mining Advisory (DTMA).

Nicki Ivory

Partner, National Mining & Metals Leader
Deloitte, Australia

Nicki is Deloitte's National Lead Partner for Mining & Metals and based in WA. She has over 20 years' professional experience in Australia and South Africa. Nicki has experience in providing valuation advice, including independent expert reports and other non-public valuations. She has also advised clients on the buy and sell-side of transactions with a focus on the resource industry and companies that service the resource industry.

ESG effects on the valuation and financing of mineral industry transactions

S. Anderson
SRK Consulting, United Kingdom

There is no question that responsible mining practices are essential for the mining industry to contribute to a sustainable world, yet how environmental, social and governance (ESG) affects mineral asset valuations and transactions in practice isn't clear.

The many ESG-related matters that can enable or prevent a mining project from becoming a profitable operation include approvals, permits and compliance; impacts on people and the environment; decarbonisation and the energy transition. Such matters are of primary importance in project planning, including assessment of material risks and demands on engineering designs and solutions, and capital and operating costs. Understanding and addressing ESG risks requires a commensurate knowledge base and corporate commitment.

In practice, mining companies, lenders, investors, financial advisors, and analysts take ESG factors into account to various extents when undertaking valuation work. This may differ for mergers or acquisitions, listings, financing, general valuations, and stock ratings. The aim is to determine if and how mining companies' bold targets and stakeholder commitments are reflected in valuations.

Realistically, negotiations are undertaken under pressure as transacting parties work towards closing deals. In parallel, parties have a requirement for projects to be derisked, with pressures on project start-up schedules and capital costs, achieving forecast production and operating costs, with a strong focus on financial returns.

Through technical due diligence work, incorporating ESG, SRK works closely with numerous parties involved in transactions and valuations. In further discussion with mining companies and advisors in the sector, the author will present findings aiming to draw a comparison between the aspirational and actual (or perceived) impacts of ESG on valuation.

Sabine Anderson

Principal Consultant (Mining Due Diligence)
SRK Consulting (UK)

Sabine Anderson is a Principal Consultant (Due Diligence, Mining Engineering) with 20 years of experience. Sabine specialises in independent technical evaluation of mining projects, to support acquisitions, debt and equity finance, including stock exchange listings.

Sabine has project managed numerous commissions for majors and juniors, preparing Independent Technical Reports, Competent Persons Reports and NI43-101s. She has managed feasibility studies for base metals and bulk minerals, applying recognised standards and best practices. Sabine's work includes economic analysis and valuation of mineral assets, and acting as expert witness.

Commodity experience includes precious, base and rare-earth metals, bulk minerals, and diamonds and gemstones. She has worked in underground metalliferous mines in South Africa for Rand Mines, coal mines in Australia for BHP, pegmatite mining, and has general experience working in all continents.
Sabine is an SRK Practice Leader, previous director of SRK UK and currently heads the mining technical department.

Meeting mineral supply demand for the energy transition - improving mine project development timeframes

K. Savinova, M. Noppé, T. Evans, S. Micklethwaite
The University of Queensland, Australia

The current typical long lead times to bring new mining projects into production are expected to have a significant if not material consequence for meeting the expected demand for mineral supply to resource the green energy transition minerals and metals.

Accelerating the development timeframes of new mines raises concerns with stakeholders over what this may mean for: 1) the confidence in investment and lending decisions, and 2) the responsible development and operation of these new projects/mines.

This is especially pertinent since the mining industry is widely considered to still be on a journey to improving its approach to social and environmental dimensions. There is also concern that the primary contributors to project delays are not well understood, and a large range of factors can be pointed to, including operational procedures, company governance frameworks, financing, policy or regulatory environments, community acceptance or technical challenges.

Given the activity within the resources sector around this topic the intent is for this to become a major new Resourcing for Decarbonisation Strategic Program initiative at the University of Queensland. The paper presents some preliminary perspectives on the challenges and opportunities for improving mine project development timeframes.

Mark Noppé

CEO
JKTech Pty Ltd (The University of Queensland)

Prof Mark Noppé is the CEO of JKTech (the technology-transfer company of the Sustainable Minerals Institute (SMI)), on secondment from his role as Director of the SMI's WH Brian Mining Geology Research Centre.

Mark provides research and advice on mining and geoscience project assessment, development and operations, supported by 25 year's consulting and 12 year's industry experience with Anglo American.

Prior to joining UQ-SMI in October 2022 Mark was the group chair of SRK Consulting and a Corporate Consultant, where he and the teams focused on a range of geosciences, project development and mining projects for industry and investment clients. He was MD of the SRK Consulting (Australasia) and prior to that was the founding MD of Xstract Mining Consultants. Mark began his Australian consulting career with the Snowden Group in 1997.

Mark is a Fellow of the AusIMM, an AusIMM director, a non-executive director of junior explorer Litchfield Minerals Limited and mentors with the International Women in Resources Mining annual program.

Mark was part of the inaugural Consultants Society (2014-2019) and its second chair. He received the AusIMM Charles Marshall Award for Technical Excellence (in consulting) in 2020.

Is the net present value of a preliminary economic assessment indicative of the market value of a mineral property?

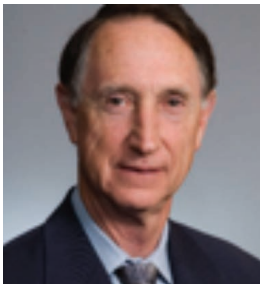
W.E. Roscoe, P. Landry, G.G. Clow, P. Chamois
SLR Consulting Ltd., Canada

A preliminary economic assessment, also known as a scoping study, is often the initial evaluation of a mineral property after mineral resources have been delineated. Its main purpose is to determine if the property offers sufficient encouragement to justify further expenditures to collect more data for more rigorous economic analysis. For gold properties in Canada and USA, a discount rate of 5% is commonly used for cash flow analysis in the preliminary economic assessment to calculate the net present value (NPV)—that is, the present-day value of projected future cash flows. This paper examines whether the NPV at this discount rate is a reliable indicator of the property's market value.

To investigate this question, information was compiled on numerous properties in Canada and the USA with preliminary economic assessments completed over the past decade. For properties that were bought and sold, the after-tax NPV from the preliminary economic assessment was compared with the market value reflected in the transaction. For properties that did not transact, the after-tax NPV was compared with the adjusted market capitalisation (AMC) of the junior company for which the property was the major asset. In these cases, the AMC served as a proxy for the property's market value.

The analysis indicated that the NPVs reported in preliminary economic assessments were significantly higher than both the transaction market values and the AMCs. To reconcile these differences, an implied discount rate in the range of 15% to 25% would generally be required.

Keywords: Preliminary Economic Assessment, Net Present Value, Discount Rate, Market Value, Mineral Property Valuation, Gold Properties



William E. Roscoe

Principal Geologist
SLR Consulting (Canada) Ltd.

William (Bill) Roscoe is a geologist with more than 50 years of experience in the mining industry in Canada and internationally. After working as an exploration geologist and consultant, he co-founded Roscoe Postle Associates Inc. (RPA) in 1985 and served as president, chairman, and chairman emeritus until its acquisition by SLR Consulting in 2019. He was instrumental in growing RPA into a nationally and internationally recognized geological and mining consulting firm with offices in Toronto, Vancouver, Denver, and London (UK).

Since 1999 Roscoe has been co-chair of the CIM Special Committee on Valuation of Mineral Properties (CIMVAL). The CIMVAL Standards are now globally recognized and referenced by the TSX-V and other international stock exchanges. He represents CIMVAL on the International Mineral Valuation Committee (IMVAL) and is a past chair.

Roscoe has published many papers and given numerous presentations and workshops over the past 40 years in Canada and internationally on valuation of mineral properties and mineral resource estimation. He taught a course for five years on mineral resource estimation as an adjunct professor at the University of Toronto.

Roscoe has a B.Sc. (Eng.) from Queen's University and M.Sc. and Ph.D. degrees from McGill University, all in geological sciences. He is a P.Eng. in Ontario and British Columbia and a Life Member and Fellow of CIM, the Prospectors & Developers Association of Canada (PDAC), and the Association of Mineral Exploration BC (AMEBC). Dr. Roscoe was inducted into the Canadian Mining Hall of Fame in 2024 along with John T. Postle.

Geopolitics and China – 'the big elephants in the mining room'

K.N. Spence
Global Mining Capital, Canada

The world is increasingly being bifurcated between two (or three) major camps. There is the Anglosphere which is led by the US, and includes the UK, Canada, Australia and New Zealand (the 'Five Eyes'), as well as the EU; and the Sinosphere which is led by China and Russia. In addition, there is a block of Non-Aligned or 'Emerging Influencers' in Africa, Latin America, South East Asia and Brics-aligned countries such as Brazil, South Africa, India and Saudi Arabia; where the two major blocks have been competing for influence.

This bifurcation of the world is starting to have (and will have) significant effects on the mining industry. These include less funding, investment and financing opportunities for mining and especially exploration companies - a key reason for the juniors' funding crisis; less mergers and acquisitions opportunities; increased demand for critical minerals exploration; demand for in-country critical minerals processing; diminished global reach in exploration and mining for mining companies; potential human resources expertise and mining talent constraints; increased resource nationalism; otherwise discounted valuation of mining assets and a scramble for deep sea metals.

China dominates processing and refining of key metals and critical minerals, such as rare earths, nickel, lithium, graphite, copper, cobalt and recently, aluminum. Over the past decades, the Anglosphere have given up the environmentally 'dirty' business of processing these key minerals, and have lost some of the alchemist skill set required to process some of these crucial commodities.

The presentation will take a deep dive into these issues and proffer some ideas to deal with the new geopolitical environment.

Keith Spence

CEO, Global Mining Capital Corp., Canada
Chair, International Mineral Valuation Committee (IMVAL)

Mr. Spence is CEO of Global Mining Capital, which is involved in Private Equity Investments and M&A in the mining sector.

He held positions in Investment Banking, Capital Markets and Mining Finance at RBC, Scotia Bank and BMO. He has been involved in numerous significant Canadian and international mining financings and investments.

As Geologist, he has experience in gold and base metals exploration in Canada, Africa, China and internationally.

Co-Chair and Co-Founder; Canadian Mining Valuation Standards & Guidelines for Valuation of mining projects (CIMVAL). Published and presented extensively on Mining Valuation. CEO; Alliance Pacific Resources, Canadian exploration Company in western China.

Member of Board of Directors of Prospectors & Developers Association of Canada, as well as served on the Board (Council) of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM).

Often quoted in the media on international mining investments, including: Bloomberg, Financial Times, Globe & Mail, AP and Reuters.

Received the Queen Elizabeth Diamond Jubilee Medal Award, for contributions to Canada; is a CIM Fellow and received the PDAC Distinguished Service Award, CIM Distinguished Lecturer Award, SME (USA) Mineral Economics Award and the Robert Elver Mineral Economics Award.

A Commonwealth Scholar; Global Management program at Harvard University; Honors B.Sc. in Geology & Geophysics and an MBA, both from Western University.

Graduate and Valedictorian of the Institute of Corporate Directors (ICD).

Recipient of the Harry Jerome Award for Outstanding Black Canadians.

Advancing mineral asset valuation

S. Bhoowanpursadh
DMT Kai Batla, South Africa

The conventional triad of resource valuation methods, namely the market approach, cost approach, and income approach has long underpinned mineral asset valuation due to its regulatory acceptance and structured methodology. However, as the mining industry grapples with greater complexity, uncertainty, and stakeholder scrutiny, reliance on these deterministic methods alone may become increasingly inadequate. This paper argues for a more integrated and contemporary valuation framework, wherein traditional approaches are complemented by probabilistic techniques, real options analysis, and advanced data-driven modelling. Such a framework will more accurately reflect the inherent risk, optionality, and dynamic nature of resource development across different stages of project maturity.

One of the central themes in modern valuation is the treatment of uncertainty. Deterministic models provide a single point estimate that can obscure the range of possible outcomes and misrepresent risk. In contrast, probabilistic valuation methods accompanied by probability distribution curves offer a richer understanding of project variability and could enhance strategic decision-making. The inclusion of real options analysis further acknowledges the value of managerial flexibility and is critical in capital-intensive projects where decisions regarding timing, scale, and deferral can significantly alter outcomes. Ethical considerations can also come to the forefront in today's ever-increasing emphasis on governance. Presenting overly precise valuations without clear disclosure of underlying assumptions, data quality, or confidence levels can mislead investors and other stakeholders. Transparent communication of valuation ranges, supported by well-documented methodologies, is essential to maintain trust and credibility in capital markets. In this context, the evolving expectations around environmental, social, and governance (ESG) performance add an additional layer of complexity that traditional financial models are ill-equipped to address.

Regulatory alignment and consistency with international standards also remain essential. These codes should recognise the role of probabilistic tools and real options in formulating reasonable grounds for valuation opinions. As such, the integration of modern techniques within a compliant framework not only enhances valuation robustness but also meets the rising demand for defensible and auditable outcomes.
The paper will also highlight the growing influence of advanced analytics and data science in valuation processes. The use of machine learning for geological modelling, predictive cost estimation, and market trend analysis is reshaping how value is assessed. Additionally, the integration of technical, economic, and ESG data allows for more holistic and realistic assessments of project feasibility and worth.

An equally important dimension is the assessment of financial risk. The incorporation of the risk-adjusted discounted rates as reflected in the weighted average cost of capital will allow practitioners to better reflect financial risk and both debt and equity financing structures, particularly in projects where capital structure has significant implications for financial viability. The capital asset pricing model also introduces a measure of a project's sensitivity to broader market returns, and thus directly integrates systematic risk into the valuation.

Additionally, the Hamada model can be applied to unlever and relever financial risk elements, thus isolating operational risk from financial risk, enabling analysts to understand the impact of capital structure on a project's risk profile. This facilitates the consistent comparison of projects with differing levels of leverage. When appropriately applied, these models demonstrate the importance of optimal capital structure in maximising project value, a crucial consideration for resource development where the debt-equity mix can vary significantly over time. These risk-adjusted measures can also be applied to investments to reflect both sovereign and jurisdictional risks which may command higher risk premiums, particularly in Africa.

Ultimately, this paper asserts that the traditional triad of valuation methods should not be discarded, but rather enhanced through complementary approaches that embrace uncertainty, foster transparency, and align with ethical and regulatory expectations. For valuation to remain relevant and defensible in the modern mining landscape, it must evolve into a multi-dimensional discipline that is as rigorous in its treatment of uncertainty and optionality as it is grounded in financial and technical fundamentals, with the appropriate risk adjustments.

Sanjey Bhoowanpursadh

Global Executive (Mining Financial Advisory Services)
DMT Kai Batla

Sanjey brings more than thirty years of combined technical and investment banking mining experience to the DMT-Group. During his most recent tenure at Nedbank's Mining and Resources Division, Sanjey has engaged in about four hundred global mining transactions, spanning fifty countries and over twenty commodities, ranging from base metals to precious metals, bulk commodities, fossil and nuclear fuels, to the more exotic battery minerals, industrial minerals, gemstones and specialised alloys. He spent most of his formative years at renowned mining giant BHP Billiton, with shorter tenors as an advisor and strategy consultant in the mining services industry. Some of his engagements over the past year include advising mining ministries on asset acquisitions and mine closures, supporting numerous development banks and institutional investors, and developing probabilistic financial risk and valuation models. At DMT, Sanjey currently drives the firm's strategic initiatives in the mining financial advisory sector offering services which include investor and lender support, debt profiling and project finance advice, project assessments and asset valuations, acquisitions and divestitures, and due diligence support.

In the past Sanjey has been a multiple award winner of several accolades sponsored by research institute, Mintek, academic institutions such as Wits University, New York Stern's School of Business and Unisa's School of Business Leadership, together with several other professional bodies such as the South African Institute of Mining and Metallurgy and the South African Coal Processing Society. As a highly accomplished professional with deep insights underpinned by a cum laude degree in extractive metallurgy and a master's degree in business leadership, Sanjey is looking forward to leveraging his extensive experience and navigating diverse markets within the financial and mining sectors. He brings not only financial and technical credibility to this conference, but also adds a strategic perspective on integrating risk, valuation and financing, all critical for navigating the increasingly complex terrain of global mineral resource development.

The east-west divide in valuation of mineral assets with specific emphasis on gold market transactions

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[1]SRK Consulting (Pty) Ltd, Australia
[2]SRK Consulting Limited, Hong Kong

As the world's largest gold producer, China's mining transactions are often considered to exhibit a pricing difference compared to similar projects in other international mining jurisdictions. This paper outlines the key differences and discusses the potential reasons for this variance, focusing on regulatory differences, valuation approaches and methods, project scale and development status. We also compare China's distinct market characteristics with western frameworks that adhere to common public reporting standards, such as JORC, NI43-101 or SAMREC. In China, many deals do not disclose commercial terms unless the projects are associated with companies listed in Hong Kong, which increases valuation asymmetries and highlights regulatory misalignments. Our analysis emphasises key factors to consider in domestic Chinese transactions when conducting comparable market analysis.

ESG perspectives and mineral property valuation: East versus West approach

V.N. Agnello
Snowden Mining Consultants, South Africa

The 'East' (predominantly China) and 'West' (traditionally the United States and Europe) are in a geopolitical competition for battery minerals. The West has focussed on supply diversification, whilst the East has focused on infrastructure and vertical integration. While both the East and the West are embracing environmental, social and governance (ESG) frameworks, key differences remain in stakeholder prioritisation; investment philosophies and strategy; and indirectly mineral property valuation.

Having dominated mineral sectors such as gold, zinc, coal, rare earth elements and iron ore production/steel manufacture, China has shifted focus over the past seven years to battery metals through developing and acquiring amongst others, lithium, graphite, copper and cobalt projects and mines, and securing supply chains for its manufacturing sector.

ESG standards are increasingly being adopted by Chinese companies. This convergence is driven by reputational risks, national efforts to standardise corporate governance, and the need to align with global market expectations and standards (including the LMEpassport system and the Joint Due Diligence Standard for Copper, Lead, Nickel and Zinc).

Chinese companies tend to focus on full mine ownership and downstream stakeholders, particularly end consumers, emphasising ethical sourcing across the supply chain. Western companies emphasise upstream concerns, focusing on the environmental and social impacts of mining projects and operations, such as their effects on local communities and the company's 'social licence' to operate.

Chinese mining companies have adopted international ESG standards such as the Organisation for Economic Co-operation and Development (OECD) Due Diligence Guidance, while also adhering to domestic standards (e.g., China Chamber of Commerce of Metals, Minerals and Chemicals guidelines) and the United Nations Guiding Principles on Business and Human Rights. This dual adherence reflects the broader trend of Chinese companies balancing international ESG expectations with national priorities. While China is increasingly adopting international best practices, it is also developing its own ESG guidelines.

In China, internationally-oriented companies, specifically privately-owned firms and investment funds are more likely to demonstrate broad engagement with ESG standards, while state-owned enterprises (SOEs) are less likely to.

In April 2017, the Chinese government promulgated the Reform Plan of the Mineral Resources Royalty Policy (MRRP) to standardise national policies regarding payment for the use of mineral resources. Current research indicates that the MRRP has significantly reduced the cash flow risk of mining-related enterprises in China. This would add further confidence to mineral property valuations in China.

Based on industry experience and anecdotal evidence for the same mineral property in Africa, in decreasing order of value, the following scenario may exist: 1) a Western company may consider a very high valuation (based on full ESG compliance to an international level); 2) a Chinese institutional investor may consider a similar or marginally lower valuation; 3) a Chinese private company may consider a lower valuation to the former two groups (and less compliance in terms of Equator Principles (EP) or International Finance Corporation (IFC) Performance Standards), and/or general compliance to a national environmental standard; 4) a Chinese SOE whose focus may be on regional consolidation, critical infrastructure upgrades, a 'first mover' option and alignment with the Belt and Road Initiative (this valuation may then be higher than the Western company valuation, by applying a zero discount rate; or be the lowest valuation, potentially with a cash offer, low-interest loans for host country, a

resource-for-infrastructure swap, less adherence to IFC or EP guidelines, and/or general compliance to a national environmental standard). Generally speaking, final transaction values are not reported for lower level and mid-tier transactions involving Chinese companies domestically nor in Africa.

Variations in ESG adoption, particularly within China, indicate that factors such as company size, ownership structure, international orientation and shareholder or fund objectives play a significant role in shaping how mining companies are guided by national investment philosophies, engagement with ESG, and ultimately how they would value a mineral property.

Vince Agnello

Principal Consultant
Snowden Optiro

Vince Agnello is a Competent Valuator (CoV) and consultant to the mining industry. He has 23 years' industry experience; of which 19 years as a CoV in all major commodities, minor minerals, and within a host of international jurisdictions, and has reported valuations under VALMIN, SAMVAL and CIMVAL codes. He has been employed in Snowden Optiro's corporate advisory division for more than 17 years. He has undertaken many NI-43 101 Technical Reports, competent person reports, due diligence and valuations for major listings, lenders, and private and institutional investors. Prior to joining Snowden in 2006, Vince worked for four years at the Department of Minerals and Energy as a commodity specialist, focusing on industrial minerals.

The importance of aligning technical, environmental and social studies – perspectives from Asia and Africa

W. Jordaan[1], A. Gimonet[2]
[1]SRK Consulting, South Africa
[2]SRK Consulting, China

Integrating environmental, social, and governance (ESG) requirements into mining projects from the exploration phase can significantly enhance project design by mitigating environmental and social risks. Proper timing and integration of ESG aspects at each project stage can optimise plans, schedules, and budgets. Despite the evolving landscape of project staging, technical studies, and ESG requirements, misconceptions persist that ESG is a hindrance to projects. Misalignment between ESG and technical studies can lead to delays, unnecessary liabilities, and social issues.

In some instances, projects have been severely delayed due to a misalignment between technical studies and ESG-related reports. With the addition of additional project decision-makers and stakeholders, the integration of ESG in technical studies is viewed through different lenses, all of which need to be identified, understood and dovetailed between the technical and ESG components. This becomes even more complex from a jurisdictional and investment perspective, and the evolving landscape of responsible mining standards. Credible and aligned technical and ESG studies are also now crucial from a geopolitical perspective, especially in the case of Chinese-owned mines operating in Africa, with increased pressure from global superpowers for securing critical minerals.

Effective ESG integration requires early involvement of ESG professionals with technical teams to understand the project's ESG context throughout its lifecycle. This allows for planning or designing out any potential ESG liabilities that may develop into material financial liabilities during the Life of Mine. Aligning ESG with technical studies can optimise operations, reduce risks, lower costs, and improve timelines. Additionally, proactive ESG management strengthens stakeholder relationships, enhancing operational and geopolitical resilience.

This paper will explore the overlap between ESG, project development, and technical studies, emphasising the importance of aligning ESG studies with project timelines. It will cover basic considerations for effective ESG and project development alignment, the role of decision-makers, and the risks involved. Key ESG aspects in project development and technical studies will be highlighted, along with the advantages of alignment. Real-life experiences and geopolitical considerations, particularly in the China-Africa context, will be discussed.

Wouter Jordaan

Partner and Principal Environmental Scientis
SRK Consulting (South Africa)

Wouter has 23 years of experience in the field of ESG and sustainability. He is an expert in conducting environmental and social due diligence with a strong focus on international and company-specific sustainability standards. Skilled in benchmarking, verification, and continuous improvement of ESG performance. He applies sustainability frameworks as commodity-specific risk assurance tools for banks, investors, and lenders, ensuring alignment with global best practices and financial stakeholder expectations.

Anne Gimonet

Principal Consultant -Environment
SRK Consulting (China)

Anne Gimonet is a Principal Consultant (ESG) and Manager of the SRK China ESG team, with over 17 years of international consulting experience, including 12+ years in China. She specializes in Environmental Due Diligence (EDD), Environmental and Social Impact Assessment (ESIA), compliance audits, contaminated land management with extensive expertise advising global clients, including multinational corporations, Chinese SOEs, and financial institutions, on ESG integration, environmental risk management, and compliance strategies in line with IFC Performance Standards and the EP. Anne has delivered large-scale, multi-site projects across Europe, Asia, Africa, Oceania, and South America, and is recognized as a trusted advisor on environmental compliance within emerging Asian regulatory frameworks. She speaks French, English, and Mandarin.

Valuation realities in Indonesian minerals: Navigating illiquidity, confidentiality, and ESG influences under VALMIN and SAMVAL

K. Whitchurch
SMG Consultants, Indonesia

Indonesia's mineral assets have emerged prominently on the global stage, driven by escalating demand linked to various sectors including energy transition, electric vehicles, and infrastructure development. However, valuations within these markets frequently confront significant challenges due to market illiquidity, confidentiality constraints in transactions, and contrasting international environmental, social and governance (ESG) priorities.

This paper explores the practical implications of these factors on mineral asset valuation, particularly highlighting the nuances that differentiate Indonesian market practices from international norms as encapsulated by the VALMIN (Australasian Code) and SAMVAL (South African Code) standards. Given the limited liquidity in various Indonesian mineral markets, many asset transactions occur between highly motivated buyers and sellers with unrealistic price expectations, complicating standard valuation practices. Additionally, the prominence of non-public financial transactions—such as private debt funding arrangements for processing facilities—and the prevalence of valuations prepared specifically for arbitration or litigation under legal privilege, significantly reduce transparency as outlined in the SAMVAL Code.

A critical examination of several public and private valuations underscores the pitfalls investors face when relying solely on valuations purportedly compliant with VALMIN guidelines. The paper also addresses how differing attitudes towards ESG factors across jurisdictions can materially influence asset valuations, emphasising the economic impacts that local ESG interpretations can have on transaction viability and price determination, in line with transparency and reasonableness principles of SAMVAL.

In presenting these case studies and market dynamics, this paper aims to enhance practitioner understanding of Indonesian mineral valuation complexities, provide insights into managing confidentiality and transparency under VALMIN and SAMVAL guidelines, and underscore the importance of aligning valuation approaches with realistic market conditions and ESG expectations.

Keith Whitchurch

Director
SMG Consultants

Keith Whitchurch is a highly experienced mining engineer with over 40 years of experience in open cut and underground mining, geology, and exploration. He has a strong track record of success in mineral project transformation, with expertise in geological modelling, reserves evaluation, pit optimisation, mine design, equipment selection, mine scheduling, backfill design and planning, project costing, and economics.

He earned a pre-JORC code master's degree in Geostatistics and Resource Classification and was an early advocate of technology, presenting the first peer-reviewed paper on artificial intelligence in mining at APCOM in 1996.

He holds a BE (Hons) and MEngSci and is recognized as a Competent Person (Mining) and a Registered Professional Engineer in Queensland (RPEQ). As a Fellow of AusIMM (FAusIMM) and a member of PERHAPI and CPI in Indonesia. Keith is notably the first foreigner registered as a Professional Engineer in Indonesia (PII) and holds the Executive Professional Engineer (IPU) Certificate. He is also listed in the ASEAN Engineering Register (AER) and APEC Engineers Register (ER), reflecting his standing as a reputable professional within the ASEAN and APEC regions.

Since 1985, Keith has played a critical role in global Resource and Reserve estimation across various commodities with career spans projects in over 25 countries across 4 continents. His reports have supported transactions exceeding USD 15 billion over the past 30 years, highlighting the significant impact and trust placed in his expertise. His extensive knowledge and experience in the financial aspects of the mining industry include M&A, sales and purchase, debt funding, and capital market transactions across various markets such as ASX, TSX, AIM, HKX, SGX, and IDX.

Additionally, he has served as an expert witness in 14 mining cases, encompassing both Litigation and Arbitration. His expertise has been recognized in multiple jurisdictions, including the United Kingdom, Singapore, the United States, Australia, Netherland and Indonesia.

When fiscal policy undermines resource value: The role of poorly considered instruments in mining taxation

C. Birch
University of the Witwatersrand, South Africa

Governments often lack a comprehensive understanding of the economic decision-making processes underlying mining operations. Inadequately designed fiscal instruments can erode project value and diminish the potential revenue that the state may derive from mining activities. This paper examines the impact of increased tax burdens on mining projects, particularly their influence on the cut-off grade. A higher tax load may elevate the cut-off grade, thereby reducing the economically minable reserve and ultimately decreasing both direct and indirect revenue streams available to the state. The concept of the Laffer curve has been cited as a justification for refraining from further increases in personal and corporate income tax rates, particularly as South Africa seeks to address its widening budget deficit. This principle is equally applicable to the taxation of the mining sector. This analysis explores the implications of South Africa's mineral resource royalty regime, corporate tax structure, and gold taxation framework. It assesses how the interaction between tax formulae and economic cut-off grades may lead to outcomes that fall short of the government's revenue expectations from the mining industry.

Mineral resources as a basis for the use of the income approach

A.N. Clay, C. Hutton
Independent Advisor, South Africa

This paper challenges the misconception that the income approach cannot be applied to mineral projects without defined ore reserves. We show that discounted cash flow modelling is fundamental from early-stage evaluation onward, supporting Reasonable Prospects for Eventual Economic Extraction (RPEEE) and guiding development. Using a set theory framework, we argue against quoting 'exclusive' mineral resources and highlight the consistent use of modifying factors throughout project stages. Probabilistic methods such as Monte Carlo simulations enhance valuation confidence, aligning with oil and gas industry standards. Ultimately, mineral resources provide a valid basis for income-based valuation, even prior to reserve declaration.

Andrew Neil Clay

Independent Advisor

Andrew Neil Clay is a geologist, mineral asset valuator, and executive consultant with nearly five decades of global experience in mining, oil and gas, and financial services. Currently Principal Consultant and Executive Coach with Ernst & Young Advisory Services Limited, he is recognized as a Competent Person and Competent Valuator under international reporting codes.

Andy's career spans field geology in Zimbabwe, senior ore reserve roles at Rand Mines, and founding Venmyn Rand, later Venmyn Deloitte, a globally respected techno-economic consultancy. He has advised on hundreds of transactions across commodities, stock exchanges, and jurisdictions, often providing independent valuations, fairness opinions, and expert witness testimony.

He has played a leading role in developing global reporting standards, including the SAMREC, SAMVAL, and SAMOG Codes, and serves as Chairman of both SAMOG and the AAPG Water Resources Management System initiative. His passion is applying rigorous statistical and financial methods to bring transparency and innovation to mineral asset reporting.

Market approach valuations using company enterprise values

T. Myburgh, I. Myburgh, G. Kriel
Mineral Valuation Group, South Africa

The Market Approach is frequently used in the minerals industry since this valuation approach is appropriate at all stages of the project life cycle. It is therefore critical that there are sufficient underlying data that are reasonable and reliable. The underlying data are greatly limited by the relatively low frequency and volume of transactions in the minerals industry. Supplementary data can be derived from enterprise values, calculated from the share price of listed entities. Since the shares of listed companies are traded continuously, these can be seen as transactions in the underlying assets in real time. Using the Mineral Valuation Group Gold Industry In-Situ Valuation Report, we compare the evaluation of a gold asset using enterprise values for over 70 companies and 400 assets vs 13 gold transactions. The resultant overlapping evaluations illustrate consistent results across both data sources, and the publicly announced transaction value falls within both value ranges, supporting the use of enterprise values calculated from the share price of listed entities as a good source of supplementary data for use in Market Approach valuations. The divergence in the resultant valuation ranges highlights the benefit of enterprise value data over transaction data in reflecting up-to-date market sentiment. In cases where there are almost no comparable transactions, the enterprise value data would be crucial to ensure sufficient relevant data for informed decision making.

Tarryn Myburgh

Senior Technical Advisor
Mineral Valuation Group

Tarryn Myburgh studied at the University of Pretoria where she undertook her Bachelor of Science degree in Geology and her Honours in Geology. Tarryn has also completed her Graduate Diploma in Engineering (GDE) in Mining Engineering specialising in Mineral Resource Evaluation through the University of the Witwatersrand.

Tarryn's area of expertise includes preparation of Competent Person's Reports for company public reporting (JORC, SAMREC, NI43-101), technical and QA/QC audits, due diligence reports, database validation, data analysis, techno-economic valuations and fatal flaws assessments.

Tarryn has provided technical assistance to a number of companies over a wide range of commodities including Platinum Group Minerals, gold, coal, uranium, base metals, iron ore, manganese, magnetite, Rare Earth Elements, sand and clay. These projects have been located throughout South Africa and globally, including Ethiopia, Guinea, Botswana, Tanzania, Benin, Zimbabwe, the DRC and Kazakhstan. Tarryn also has experience in unconventional petroleum projects throughout Africa and has prepared SAMOG compliant public reports, fatal flaws assessments, exploration operating procedures, and technical and QA/QC audits.

As a senior technical advisor to Mineral Valuation Group, I primarily provide strategic guidance and project optimisation to companies looking to advance their early-stage exploration assets, optimise their portfolio of assets or to enter the mining industry.

The implementation of the value chain optimisation model at Valterra Platinum

O. Gray, R.L. Sakaran, B.J. Kloppers
Valterra Platinum, South Africa

Valterra Platinum (previously Anglo-American Platinum), in its effort to continuously improve valuation methodologies supporting its strategic planning process, developed an integrated Value Chain Optimisation Model (VCOM). Qerent was selected as the techno-economic modelling platform due to its complex modelling capability, allowing for integration between mining and processing. The role of the model is to provide a portfolio-level modelling environment covering the entire mine-to-market value chain to augment both tactical and strategic decisions. The model accepts inputs across multiple functions comprising mining, processing, marketing, and finance. The ability to analyse scenarios by adjusting various strategic levers within the model allows for more consistent and informed decisions, reinforcing the culture of data-driven decision-making. VCOM has led to an increased availability of data and standardisation of calculation methodologies, with a reduction in human error in the collation of data. The benefit to the organisation is less time spent on data processing and increased insight by shifting efforts to the analysis and interpretation of outcomes. The VCOM modelling solution design, how challenges were addressed, and the future development options for VCOM are covered in this paper.

Ohna Gray
Manager: Value Chain Optimisation and Portfolio Planning
Anglo American Platinum

With over a decade of experience in mining and finance, I have built a career that began with the Anglo American Platinum Graduate Program in 2009 and became a CIMA professional in 2014. Currently, I am the Manager of Scenario Modelling within Anglo American Platinum's Corporate Development team, specifically within the Portfolio Management space. My primary focus is running robust combinations of projects that will shape the company's strategic direction and assist stakeholders with decision-making where multiple pathways for assets within our portfolio exist. I was deeply involved in creating the Value Chain Optimisation model (VCOM), which aims to maximize value through the full processing value chain, from mining to final saleable material

Rivashan Lee Sakaran
Senior Specialist: Data Analytics and Planning
Valterra Platinum

Rivashan is an Senior Specialist in Data Analytics and Planning - having worked in the platinum smelting production space as a metallurgist and in the process control space as a control engineer. He now is in the Corporate Development department of the company. He is passionate about technology and the implementation thereof across the business to improve efficiency and enhance automation alongside his technical knowledge of the operating parameters in the processing of mined products.

Valuation of damages in international arbitration cases

H. Rosen
Secretariat, Canada

Valuation of mineral properties and mining projects, like other types of valuation, has its share of litigation and arbitration. This is especially so because of the international scope of mining. Projects may be subjected to expropriation, creeping expropriation, resource nationalism and arbitrary taxation issues.

The presentation will do a global scan of several valuation disputes and arbitration results, compensation and settlements. These will include projects in Latin America, Asia and Africa at various stages of development.

Modifying factors from mineral industry reporting regulations and codes, and their impact on mineral asset valuations

K. Johnstone
Ukwazi, South Africa

The South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves defines Modifying Factors as "considerations used to convert Mineral Resources to Mineral Reserves. These include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social, and governmental factors." Other reporting codes apply similar definitions.

Mineral Reserves are estimated based on technical studies and LOM plans that include application of these Modifying Factors, and such studies and assessments must demonstrate that, at the time of reporting, extraction and marketing of the saleable products derived from the Mineral Reserves could reasonably be justified. This process culminates in the publication of a Competent Persons' Report, which includes a valuation of the mineral project. The net present value and internal rate of return in the valuation are key determinants for debt and equity funders in their decision to finance the project.

In this discussion paper, we examine the impact of modifying factors on project size, production rate, recoveries, expenditure, revenue, and other metrics, and their eventual implications on project valuation.

Through several case studies synthesised from actual projects Ukwazi has developed, in which contentious issues are addressed, we demonstrate the influence of modifying factors and the decision process involved in determining these on eventual project valuation.

Our observation is that:

- Some modifying factors, such as mineral price, discount rate, regulatory environment (including ESG requirement), are outside of the control of the project owner, and may be considered objective factors, while others, such as choice of commodity, project size, configuration, mining method and processing regime, are within their control.
- These cases demonstrate the dynamic tension between independent consultants, project sponsor/developers, regulators (state and market) and the financial market participants whose specific stakeholder interests play a subjective role in the development, operation, regulation, and funding of mineral projects.

The case studies are:

1. An existing operation which seeks to extend mining into a wetland
2. A project with potentially economic satellite subprojects and material Inferred Mineral Resources
3. A project in which parameters driving revenue materially changed late in the study
4. A steeply-dipping metal mine in which the inclusion of significant Inferred Mineral Resources influences the mine design, production rate, and hence project economics

Through these case studies, we aim to show key learnings in addressing physical modifying factors and modifying factors indirectly linked to the mining cycle to achieve code compliance and a fair and reasonable economic assessment.

Keywords: Mineral Resource, Mineral Reserve, modifying factors, mineral asset risk, reasonableness.

Kerron Johnstone

Lead: Mine Valuations
Ukwazi Transaction Advisory

After five years in engineering and five years in merchant banking, I found myself working in engineering consulting, specialising in financial analysis and modelling of engineering capital projects.

In the last 15 to 20 years I have more or less specialised on financial modelling and analysis in the mining sector, working on concept, prefeasibility and feasibility studies, Competent Persons/Mineral Experts reports, and due diligence studies for mining operations and projects in a wide range of countries and minerals. Most recently I managed the NI 43 101 Feasibility Study Report for Goviex's Muntanga Uranium Project in Zambia.

I have also worked on many projects in the water and alternative energy sectors.

Mineral asset valuation: A critical component of purchase price allocation for financial reporting

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Ernst and Young Advisory Services (Pty) Ltd, South Africa

When a mining company acquires another mining entity, mineral project or assets, it must allocate the purchase price among the acquired assets and liabilities. This process is known as Purchase Price Allocation (PPA). Valuation of mineral assets is crucial to the PPA process within the minerals industry. It ensures accurate valuation, adherence to accounting standards, and optimal financial and tax outcomes. By utilising various valuation approaches, companies can achieve fair and precise allocation of the purchase price, thereby supporting sound financial management and reporting.

This paper will examine the PPA process, beginning with determining the total purchase price and its distribution to individual identifiable assets and liabilities. For a mining company or project, the largest assets typically include property, plant, and equipment (PPE) and the mineral asset in the ground, comprising mineral resources and mineral reserves. The application of different valuation methods aids in determining the value of PPE and mineral assets, which may not necessarily reflect the transaction price. The actual price achieved in a transaction may vary, depending on factors such as a competitive bidding environment, prevailing market sentiments, commodity prices, and perceived special value derived from the transaction.

PPA is fundamental when determining how the total purchase price is distributed among the acquired assets and liabilities. This allocation is essential for compliance with accounting standards and for accurately reflecting the financial position of the acquiring company as of the Balance Sheet date. Additionally, PPA plays a pivotal role in providing stakeholders with a clear understanding of the economic implications of an acquisition, thereby facilitating informed decision-making.

Keywords: Mineral Asset Valuation, Financial Reporting, Purchase Price Allocation (PPA)

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Georges is a valuations professional from EY Parthenon, having trained as a CA and also becoming a CFA charter holder.
Georges leads the Capital Equipment Valuation team and has served listed mining clients in valuation and accounting of acquisition targets across various commodities.

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