Global Arbitration Review

The Guide to Damages in International Arbitration

Editor
John A Trenor

Fourth Edition

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Preface

This fourth edition of Global Arbitration Review's *The Guide to Damages in International Arbitration* builds on the successful reception of the earlier editions. As explained in the introduction, this book is designed to help all participants in the international arbitration community understand damages issues more clearly and to communicate those issues more effectively to tribunals to further the common objective of assisting arbitrators in rendering more accurate and well-reasoned awards on damages.

The book is a work in progress, with new and updated material being added to each successive edition. In particular, this fourth edition incorporates updated chapters from various authors and contributions from new authors, including a chapter on damages issues in light of covid-19. This fourth edition seeks to improve the presentation of the substance through the use of visuals such as charts, graphs, tables and diagrams; worked-out examples and case studies to explain how the principles discussed apply in practice; and flow charts and checklists setting out the steps in the analyses or the quantitative models. The authors have also been encouraged to make available online additional resources, such as spreadsheets, detailed calculations, additional worked examples or case studies, and other materials.

We hope this revised edition advances the objective of the earlier editions to make the subject of damages in international arbitration more understandable and less intimidating for arbitrators and other participants in the field, and to help participants present these issues more effectively to tribunals. We continue to welcome comments from readers on how the next edition might be further improved.

John A Trenor
Wilmer Cutler Pickering Hale and Dorr LLP
November 2020

Part IV

Industry-Specific Damages Issues

25

Damages in Oil and Gas and Mining Arbitrations

Darrell Chodorow and Florin Dorobantu[1]

Introduction

Natural resources development occurs in a highly globalised environment. As noted by UNCTAD's analysis of cross-border project finance transactions, '[m]ining is the most international industry, as more than half of all projects are sponsored by foreign companies, followed by oil and gas'.[2] For example, although the value of production from Canadian mines accounts for 4.4 per cent of global industry output,[3] nearly half of the world's publicly traded mining companies are listed on Canadian exchanges.[4] The global investment patterns for these industries create frequent international disputes, both investor-state and commercial, involving large damages claims.

Resource extraction projects are heavily intertwined with governments. Concessions often are acquired from governments, development requires permits issued by governments, and state-owned companies often participate in projects. The potential for allegations of government interference is significant, and many projects in this sector have been political flashpoints. The value of these projects can be very large, particularly after up-front investments to develop the project have been completed. Moreover, their value can increase suddenly and substantially because of favourable results from exploration activities or shifts in commodity prices. These circumstances create many opportunities for actual or perceived illegal actions by governments in the form of concession termination, state harassment, denial of permits, windfall taxes, royalty disputes, regulatory changes and even nationalisation. In some cases, states themselves seek counterclaim damages for

1 Darrell Chodorow and Florin Dorobantu are principals at The Brattle Group.

claimant acts that are alleged to have harmed the value of the concession and the environment.[5] The high potential for disputes is borne out in case statistics, with extractive sector cases accounting for 16 per cent of known investment cases.[6]

Commercial activity in resource extraction also creates significant potential for cross-border disputes between private parties. Investments are large and construction is often outsourced to contractors. The sector is often the subject of cross-border transactions[7] and joint ventures are a common way for even the largest companies to share risks. Projects also frequently involve long-term sales contracts with customers that may come out of balance over time and lead to disputes or arbitrated resets. Thus, the resource sector sees large numbers of commercial disputes, including disputes about construction, shareholder agreements, share purchase agreements and commodity sales agreements (e.g., take-or-pay and gas price disputes). For example, the London Court of International Arbitration disclosed that 22 per cent of the institution's disputes were in the energy and resources sector,[8] and International Chamber of Commerce data indicate that mining and energy accounted for 8 per cent and 10 per cent of its cases, respectively.[9]

Figure 1, below, describes the typical life cycle of mining and oil and gas projects and some types of disputes that can arise. Companies begin prospecting to find candidate sites to explore. The exploration and development process follows, potentially marked by disputes about licences and permits. Once development is complete, construction begins, often giving rise to disputes between developers and construction contractors. During the operation phase, when producers are extracting and selling the reserves, disputes have often arisen that relate to production taxes, royalty rates, changes in regulatory requirements, and commodity sales contracts. Upon closure, potential disputes may arise regarding

5 Venezuela alleged that the Rusoro's mining practices jeopardised the ability to meet production targets, causing a loss to the state, which was dismissed for lack of jurisdiction. *Rusoro Mining Ltd. v. Bolivarian Republic of Venezuela*, ICSID Case No. ARB(AF)/12/5, Award, ¶¶ 598 to 610 and 897, 22 August 2016 [*Rusoro*]. Ecuador made a successful counterclaim against Perenco for environmental damages. 'Both sides win damages in Ecuador oil block dispute', *Global Arbitration Review*, 29 September 2019, https://globalarbitrationreview.com/article/1208842/both-sides-win-damages-in-ecuador-oil-block-dispute (last accessed 2 October 2020).

6 UNCTAD, *Investment Dispute Settlement Navigator*, updated 31 December 2019, https://investmentpolicy.unctad.org/investment-dispute-settlement (last accessed 2 October 2020). The count excludes disputes involving downstream and support activities.

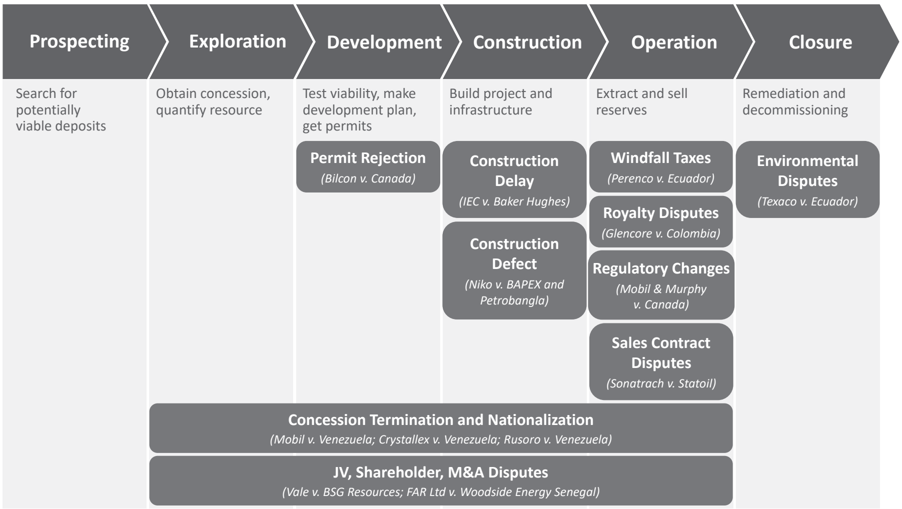
7 *World Investment Report 2020 – International Production Beyond the Pandemic*, 16 June 2020, p. 17.

8 LCIA, *2019 Annual Casework Report*, 19 May 2020, http://www.lcia.org/media/download.aspx?MediaId=816) (last accessed 2 October 2020).

9 IPAA, *International Dispute Resolution*, 2011, p. 1, https://www.ipaa.org/wp-content/uploads/2016/12/IPAA_DisputeResolution2011.pdf (last accessed 2 October 2020).

environmental remediation. At many stages of the process, assets may be subject to concession termination or nationalisation by governments, and commercial disputes may arise over joint venture and shareholder agreements and merger and acquisition transactions.

Figure 1: Disputes across the extraction project life cycle



Many of these projects are especially large – one study identified 163 megaprojects (investment of more than US$1 billion) in the upstream oil and gas sector with an average size of US$6.6 billion.[10] The amounts at stake in arbitrations are correspondingly large, having resulted in the some of the largest awards on public record: seven of the 10 largest investment awards are in the extractive sector (Table 1, below), including the US$50 billion *Yukos* award, the largest on record.[11] Anecdotal evidence from commercial cases suggests similarly large amounts in play, such as the US$1.2 billion award in *Vale v. BSG Resources*.[12]

Table 1: Ten largest investment awards

	Case	*Award (US$ billion)*	*Industry*
1	*Yukos Investors v. Russia* (3 consolidated cases)	50.0	Oil and gas
2	*ConocoPhillips v. Venezuela*	8.4	Oil and gas
3	*Tethyan Copper v. Pakistan*	4.1	Mining
4	*Union Fenosa v. Egypt*	2.0	Downstream oil and gas
5	*Occidental v. Ecuador (II)*	1.8	Oil and gas
6	*Mobil and others v. Venezuela*	1.6	Oil and gas
7	*Crystallex v. Venezuela*	1.2	Mining
8	*Oschadbank v. Russia*	1.1	Banking
9	*Rusoro Mining v. Venezuela*	1.0	Mining
10	*Al-Kharafi v. Libya and others*	0.9	Real estate

Other than the largest cases, extractive sector disputes also often involve larger amounts than other industries. Table 2 shows the median amounts claimed and obtained by the investor (including through settlement) by industry, excluding cases in which no damages were awarded. In oil and gas, both claims and awards are approximately 10 times as large as the median non-extractive case, with half of the cases involving claims of US$1.2 billion or more, and awards or settlements of more than US$368 million. In mining, claims are also often significantly larger than those sought by claimants in other industries, but the amounts obtained are often similar because awards in many mining disputes on early-stage projects have been based on historical costs incurred by the claimant.[13]

Table 2: Median claims and awards

	Median claim (US$ million)	*Median award (US$ million)*
Oil and gas	1,200	368
Mining	415	19
Other industries	123	27

Important value drivers

Although there are many definitions of value, when used in the context of damages in international arbitration, value typically means fair market value (FMV). The FMV of a project is the price at which it would trade on the valuation date in an open market between willing and informed parties that do not act under any compulsion to trade.

Natural resource projects, like any productive assets, have value if they can generate future net cash flows with a positive present value. This value, therefore, is driven by factors that affect the magnitude, timing and riskiness of cash flows.

Unlike other business opportunities, natural resources are exhaustible, so total output depends on the size of the mineral or hydrocarbon deposit available for extraction. Deposit size cannot be known with certainty before extraction, so what matters for value are the estimates of size. In the extractive sector, these estimates are called resources and reserves. The terms mean different things in the oil and gas and mining industries, but generally, reserves are the portion of resources that can be extracted economically at current prices.

The most frequently referenced definitions are published by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) for mining and by the Society of Petroleum Engineers (SPE) for oil and gas.[14] Resources and reserves estimates are further classified based on geological uncertainty and confidence in commercial extractability. Figure 2 illustrates the CIM classification, used in the mining industry.

Figure 2: Mining resources and reserves classification framework (CIM)[15]

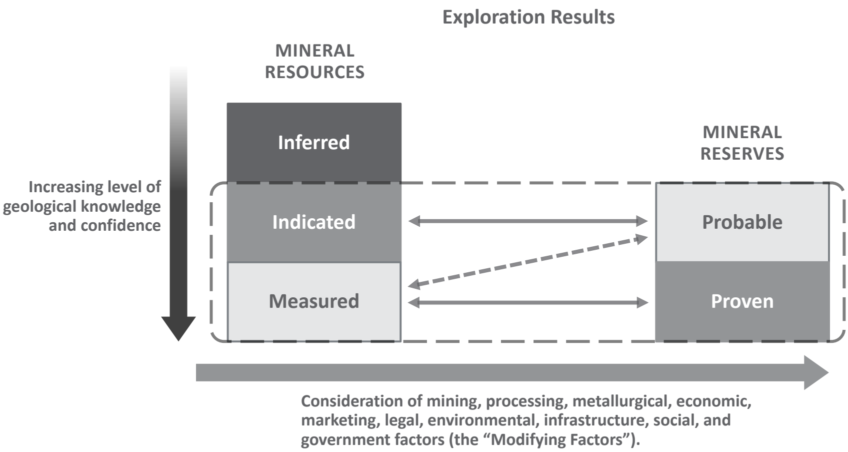
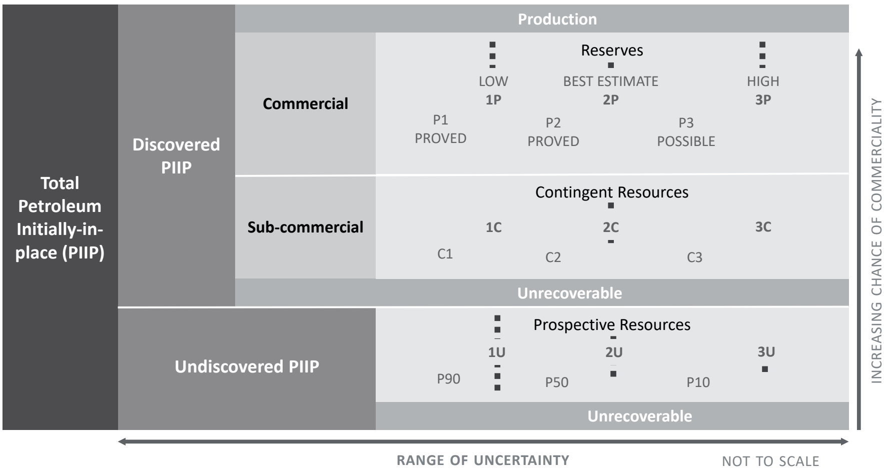


Figure 3, below, is the SPE's classification system for hydrocarbon deposits known as the Petroleum Resources Management System. Setting aside estimated unrecoverable amounts and prior production, the remaining deposit is considered to be the recoverable resource. It comprises reserves (proved, probable and possible) that are commercially recoverable, contingent resources that have a chance of being commercialised in the future, and prospective resources estimated to exist outside currently known accumulations with a chance of being commercialised.

14 Canadian Institute of Mining, Metallurgy and Petroleum Definition Standards on Mineral Resources and Reserves, adopted on 20 May 2014 [CIM Definition Standards]; Petroleum Resources Management System [PRMS], revised June 2018. Definitions can vary across jurisdictions, but they have much in common given the global nature of the sector.

15 'Figure 1, Relationship between Mineral Reserves and Mineral Resources' from the 'CIM Definition Standards – For Mineral Resources and Mineral Reserves'. Reproduced with the permission of the Canadian Institute of Mining, Metallurgy and Petroleum.

Figure 3: Oil and gas resources classification framework (SPE)[16]



The size of the deposit determines a project's duration and capacity. There is a trade-off between duration and capacity – a larger-scale project extracts the resource faster and generates higher revenues in present value, but requires higher up-front capital expenditures. One of the reasons why owners conduct detailed feasibility studies is to identify the scale that yields the highest value given expected prices and costs. Projects that end up in arbitration tend to be large in scale, requiring substantial up-front investments, and may have long expected lives, measured in decades.

Price expectations influence value directly and are typically the most important factor causing volatility in project values. Commodity prices can change rapidly, making the valuation date important and often itself a matter of dispute. Increased prices also have been a factor causing governments to impose new measures on producers that lead to disputes.[17] For example, these effects have been especially large in expropriation cases, in which changing commodity prices during the time between the expropriation date (itself sometimes motivated by high prices) and the hearing date cause large differences in damages between the *ex ante* and *ex post* framework.[18]

Extraction costs also influence profitability and project value. They are determined by both project-specific and broader market factors. The project-specific factors include the quality of the deposit (e.g., ore grade, stripping ratio, amount of impurities, deposit depth), the method of extraction (e.g., open-pit versus underground in mining, conventional versus hydraulic fracturing in oil and gas), location (e.g., ease of access to key inputs such as water and power, transportation costs to market, weather disruptions, effects on nearby communities or environmentally sensitive areas). The broader market factors include fuel costs, labour costs, equipment leasing rates and shipping costs.

16 'PRMS, Figure 1.1' reproduced with the permission of the Society of Petroleum Engineers. In this figure: 1P = proved reserves, 2P = proved and probable reserves; 3P = proved, probable, and possible reserve; 1C to 3C refer to contingent resources estimated with varying degrees of certainty from high to low; and 1U to 3U refer to prospective resources also estimated with varying degrees of certainty.

Fiscal terms also affect profitability. In addition to corporate income tax, extractive projects often pay royalties to resource owners. Unlike income taxes, royalties are typically levied on the value of the product rather than the profits it produces. In many jurisdictions, the state owns all subsoil resources, making royalty rates a policy issue that generates political risk and can result in disputes.[19] State ownership also gives rise to renewal risk when exploitation licences are expected to expire before resources are exhausted.

Country risk beyond fiscal terms is also important. The value of otherwise-similar projects can vary greatly depending on the stability of the political regime, the risk of expropriation, the strength of legal protections afforded foreign entities, and the chances of civil war, terrorism and other forms of political violence. Some country risks arise from state acts prohibited by investment treaties and may be excluded from valuation for damages purposes in that context.[20]

Social and environmental risk can be critical to project value. Extractive projects affect the environment and the livelihoods of nearby communities to an extent that depends greatly on location, and also on project design and the owner's strategy of engaging with the community and civil society groups. Virtually all projects require environmental permits, and often the process of acquiring permissions and licences is lengthy and costly. The term 'social licence to operate' has come to embody a project's ability to obtain the assent and support of a variety of stakeholders, beyond compliance with the formal permitting process. Failure to obtain the social licence to operate can lead to increased costs, delay and even project failure.[21] Social licence risk has increasingly come to the attention of arbitration tribunals and has been central to recent and ongoing cases. For example, the tribunal in *Bear Creek Mining Corp v. Republic of Peru* found that 'there was little prospect for the Project to obtain the necessary social license to allow it to proceed to operation',[22] awarding as a result sunk costs as damages.[23]

Valuation approaches

Valuation standards and guidelines

The three most common general approaches to valuation are known as income, market, and cost. These approaches can be applied to energy and natural projects, but their reliability depends on the information available. The amount of information is correlated to project stage, with earlier-stage exploration properties generally having less project-specific information than more advanced or producing assets.

19 See, e.g., *Glencore International A.G. and C.I. Prodeco S.A. v. Republic of Colombia*, ICSID Case No. ARB/16/6.

20 F Dorobantu et al, *Country Risk and Damages in Investment Arbitration*, 31(1) ICSID Rev. 219–31 (2016).

21 See, e.g., R Davis et al, 'Costs of Company-Community Conflict in the Extractive Sector', *Corporate Social Responsibility Initiative Report*, No. 66, 2014.

22 *Bear Creek Mining Corporation v. Republic of Peru*, ICSID Case No. ARB/14/21, Award, ¶ 600, 30 November 2017.

23 Social licence risk is also a key issue in the ongoing *Gabriel Resources v. Romania*, ICSID Case No. ARB/15/31, which has seen expert testimony on the issue. See Claimant's Reply and Counter-Memorial on Jurisdiction, 2 November 2018, pp. 18 to 19 and Respondent's Rejoinder, dated 24 May 2019, p. 9, available at https://www.italaw.com/cases/4721.

Industry groups in countries with substantial extractive industries have developed valuation standards and guidelines. In Canada, for example, the CIM publishes the CIMVAL Code for the Valuation of Mineral Properties,[24] which imposes standards on valuation professionals and provides guidelines on methodology. The CIMVAL Code identifies which valuation approaches are generally considered appropriate for each project stage, shown below in Table 3.[25] The same table is found in the Australasian VALMIN Code,[26] while South Africa's SAMVAL Code provides more nuanced, but largely similar, recommendations and adds guidance for dormant and defunct properties.[27] For the oil and gas industry, the Society of Petroleum Evaluation Engineers (SPEE) provides valuation guidance.[28] The industry guidelines identify valuation approaches that are generally appropriate, but do not require that any specific method be applied. The decision as to which method or methods to apply in any particular case is left to the valuer.

Table 3: Valuation approaches for different types of properties (CIMVAL Code, VALMIN)

Valuation approach	*Exploration properties*	*Mineral resource properties*	*Development properties*	*Production properties*
Income	No	In some cases	Yes	Yes
Market	Yes	Yes	Yes	Yes
Cost	Yes	In some cases	No	No

We discuss the income and market approaches below. The cost approach relies on the economic principle that, under normal conditions, a buyer will pay no more for an asset than the cost to obtain an equivalent asset.[29] The historical cost incurred may bear little resemblance to the current value for natural resources projects. Exploration begins with the implementation of techniques to identify prospects that look promising for further exploration and development. Therefore, the results of these exploration activities can cause the FMV to be materially higher or lower than the project's historical cost, rendering the approach an unreliable means to make a claimant whole in most cases. The cost approach is discussed in more detail in Chapter 11, so it is not addressed further here.

Income approach

The income approach estimates the futures cash flows that an asset can generate, adjusts them for timing and risk from the perspective of the valuation date, and then adds them together to calculate the asset's market value. By projecting directly the components that make up the asset's cash flows, including anticipated production, prices, and capital and operating costs, the income approach can take into account an asset's unique characteristics.

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24 The CIMVAL Code for the Valuation of Mineral Properties, prepared by the Special Committee of the CIM on the Valuation of Mineral Properties [CIMVAL Code], 29 November 2019; an earlier version was published in 2003.

25 CIMVAL Code, ¶ 3.3.3.

26 VALMIN 2015, § 8.8. The VALMIN code was first adopted in 1995.

27 SAMVAL 2018, § 4.4. The SAMVAL code was first adopted in 2008.

28 SPEE, Perspectives on the Fair Market Value of Oil and Gas Interests, 2002.

29 International Valuation Standards Council, International Valuation Standards 2017, at 42 to 43 (¶ 60.1) (2017).

The income approach is well suited to the valuation of natural resource projects.[30] The discounted cash flow (DCF) method was proposed in the majority of investment arbitrations with publicly available awards on damages, and was rejected by the tribunals in favour of alternative valuation methods in approximately a third of those cases.[31]

Two principal factors contribute to the suitability of the income approach to resource extraction projects. First, the outputs produced by most oil and gas and mining projects are commodities. They sell in well-developed and liquid markets, often global in scope, with relatively little uncertainty about the producer's ability to find buyers. Although commodity prices can be volatile, the existence of derivative markets – in which futures, forwards and options are traded – provides information that may allow the valuer to quantify price risk and develop objective, market-based price projections well into the future.[32] Futures and forward prices are the prices at which market participants today agree to exchange a unit of the commodity (e.g., a barrel of oil or an ounce of gold) at a known date in the future. They incorporate, therefore, the market participants' expectations about the average price level in the future and the risk premium necessary to eliminate that risk. Forecasts prepared by professional forecasters may add additional information but must be carefully understood and interpreted.[33]

Second, large projects are only undertaken after the owners have conducted technical and economic assessments, such as feasibility and pre-feasibility studies and environmental impact assessments, which require detailed analyses of project viability. Once projects are in production, operators update production plans regularly to incorporate information developed during operations. These technical documents typically provide an objective basis to build projections of production and costs that incorporate the specific features of the asset being valued.

Valuing an asset by the income approach also requires directly quantifying the effects of risks on value. First, all risks should be factored into the cash flow, so that the projected net cash flows are expected values, in a statistical sense: they reflect what is anticipated to happen on average, considering the likelihood of both positive and negative outcomes.[34] Second, systematic risks require an additional adjustment to account for investors' aversion to market risk.[35]

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30 The income approach, and its most frequent implementation (the discounted cash flow [DCF] method), has also become standard in arbitrations involving other industries.

31 Based on authors' review of publicly available awards in cases listed in UNCTAD IDSN. Not all the cases involved project valuation questions.

32 See, e.g., E Schwartz, et al, 'Short-Term Variations and Long-Term Dynamics in Commodity Prices', *Management Science* 46(7), pp. 893 to 911, 2000; D Laughton, et al, 'Reversion, Timing Options, and Long-Term Decision-Making', *Financial Management* 22(3), 1993. As project lives often exceed the horizon for which derivative contracts are listed, long-term projections can be developed using economic models of price evolution, calibrated using historical market prices.

33 For example, the US Energy Information Administration publishes long-term forecasts for crude oil prices in its *Annual Energy Outlook* (https://www.eia.gov/outlooks/aeo/) and the World Bank publishes forecasts across a range of commodities in its quarterly *Commodity Markets Outlook* (https://www.worldbank.org/en/research/commodity-markets). Many investment banks also publish commodity forecasts.

34 R Brealey, S Myers and F Allen, *Principles of Corporate Finance*, 10th edition, pp. 223 to 227.

35 Systematic risks are those risks that cannot be eliminated by holding a diversified portfolio of investments because they affect all assets to some degree. See Brealey, Myers and Allen, Chapter 10.

In the traditional DCF method, the adjustment for systematic risk takes the form of a risk premium added to the risk-free rate: assets that are subject to more systematic risk carry a higher premium. The higher the risk premium (and hence the discount rate), the larger the downward adjustment to expected cash flows and the lower the asset value, all else remaining constant.

A more sophisticated market-based DCF method, known as the certainty-equivalent DCF, can better incorporate the impact of systematic risk using market signals, when those are available. Rather than collapsing the adjustment for systematic risk into a single number, each cash flow stream (prices, capital expenditures, operating costs) is risk-adjusted individually, using the information provided by futures or forward prices.[36] By using futures prices for the value drivers sensitive to systematic risk,[37] in addition to accounting for all other risks the same way one would in the traditional DCF method, the resulting cash flows projections become certainty-equivalent cash flows. As the name suggests, these risk-adjusted cash flows are projections of what a market participant would be willing to accept in exchange for eliminating all risk. Having incorporated the effect of risk directly into the cash flows projections, the discount rate needs to reflect only the time value of money, for which the risk-free rate is appropriate. The *Tethyan* tribunal relied on this market-based DCF method to quantify damages from the expropriation of a copper-gold project at the feasibility study stage, noting its ability to reliably incorporate the effect of risk, its use and acceptance in the mining industry,[38] and its particular applicability to the circumstance of that case.[39]

Natural resource projects often have additional value from their ability to act as 'real options'. Real options arise from management's ability to adjust operations as economic circumstances change; examples include investing in capacity expansion when the price outlook is unexpectedly favourable, and mothballing or even terminating a project early, before resources are exhausted, when price declines make current production unprofitable, or less profitable than preserving the resources for future extraction in a more favourable price environment. The importance of real options varies across projects, but is generally higher when prices and costs are more volatile, making large deviations from expectations (and therefore the need for changing course) more likely. The value of real options can be particularly significant in the oil and gas and mining sectors, in which volatility is common. The certainty-equivalent DCF method is the standard tool for estimating the value that optionality may add to a project.

36 For a primer on commodity prices, see R Pyndick, 'The Dynamics of Commodity Spot and Futures Markets: A Primer', *The Energy Journal*, 2001, 22(3), pp. 1 to 29.

37 The main source of market risk in a natural resource project is the price risk, which affects the revenue stream. Cost elements, however, can also incorporate systematic risk elements; e.g., in mining, fuel costs can be a substantial portion of costs. Fuel costs are correlated with crude oil prices, which have recently shown increasing correlation with overall markets, and hence increased systematic risk.

38 The certainty-equivalent DCF method, labelled the 'real options' method when combined with the 'real options' element described below, is listed as a primary method in the CIMVAL Code (¶ 3.3.4). See also CIMVAL Letter to International Valuation Standards Council Re: Valuations in Extractive Industries – Discussion Paper, 22 October 2012, available at https://www.ivsc.org/files/file/download/id/337.

39 *Tethyan Copper Company Pty Limited v. Islamic Republic of Pakistan*, ICSID Case No. ARB/12/1, Award, ¶ 360, 12 July 2019 [*Tethyan*].

Market approach

The economic theory known as the 'law of one price' dictates that comparable assets should transact at similar values.[40] The market approach leverages this principle, estimating the FMV of the subject asset based on observed prices from market transactions of comparable assets. Market values can be observed from share prices of publicly traded companies (traded comparables), which can be used to derive a company's market value, or prices paid for comparable assets in transactions (comparable sales). Reliable use of the market method is preconditioned on identifying close comparables with observable market values, often a difficult task.

Valuation multiples from comparable assets

The most common application of the market method uses valuation multiples from comparable assets. Complex assets often have no perfect comparable because of size differences in profits or resource bases. To control for size, observed values are translated into multiples of financial measures (e.g., EBITDA)[41] or deposit size (e.g., US$/barrel of oil). These multiples are applied to the relevant quantity (e.g., EBITDA or barrels) for the subject company, as illustrated below. Pre-production assets are generally valued using multiples of deposit size, while operating assets can also be valued using earnings or cash flow multiples.

Figure 4, below, illustrates the method to value an oil property. The observed US$1,000 FMV of the comparable asset is converted into a valuation multiple of US$40 per barrel of reserves. That multiple is then applied to the reserve base of the subject asset to derive its FMV. Because the subject asset is valued based on its size relative to the comparable asset, the multiples method is sometimes called relative valuation.

Figure 4: Illustration of comparables method for oil reserves

Comparable asset						*Subject asset*		
FMV ($)		**Barrels of reserves**		**$ per barrel**		**Barrels of reserves**		**Implied FMV**
1,000	÷	25	=	40				
				⇩				
				40	x	100	=	4,000

The appeal of multiples is its apparent simplicity. DCF valuations require one to develop explicit assumptions driving an asset's cash flows. Relative valuation bypasses these explicit assumptions, instead relying on multiples derived from commonly available market data. The ease of implementation can be deceptive, because the use of a valuation multiple carries many strong, implicit assumptions that can undermine the method's reliability.

FMV reflects market expectations about key aspects affecting the value of the asset. In the illustration above, the $1,000 observed value for the comparable asset would be a function of a variety of expectations about future project performance, such as those in Figure 5, below. Applying the $40 per barrel multiple in the chart above assumes that the

40 If comparable assets did not trade a similar prices, market participants would be able to generate a profit through arbitraging the price differential, which would cause the difference to disappear or become minimal.

41 EBITDA (earnings before interest, taxes, depreciation and amortisation) is a proxy for operating cash flow.

subject asset is comparable in all these dimensions. Therefore, multiples analysis requires experts and tribunals to carefully assess comparability and the adjustments that attempt to account for differences.

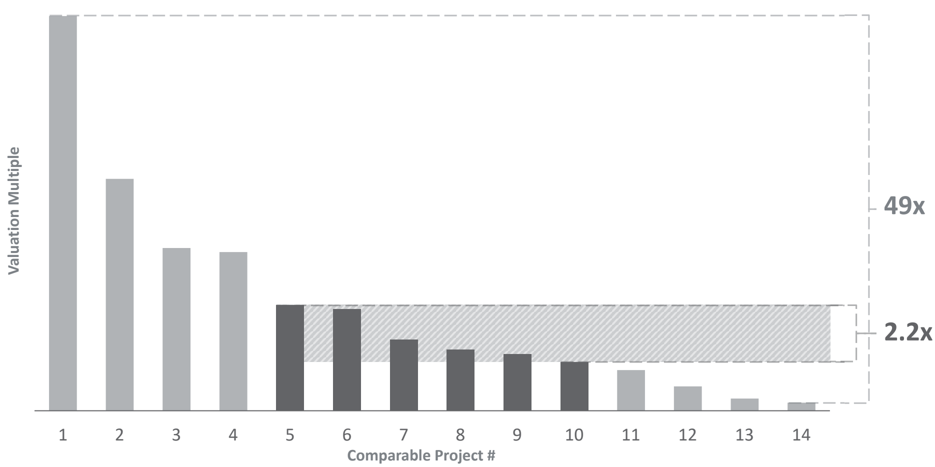
Figure 5: Illustrative dimensions of comparability for extraction projects

Revenue expectations	*Extraction costs*	*Resource characteristics*
Pricing environment	Capex requirements	Permitting risk
Cost to reach markets	Operating costs	Geological certainty
Quality premium/discount	Royalty obligations	Expansion potential

◄────── COUNTRY RISK ──────►

Figure 6, below, presents a multiples analysis from an expert in a case on which the authors worked. The analysis identified 14 different projects deemed comparable. The resulting multiples covered a wide range, with the highest being 49 times larger than the lowest. The expert dropped the four highest and lowest multiples (light grey), leaving six multiples (black), with a more moderate implied valuation range. However, even among this narrowed set, the variation remains wide – the bottom of the range implies a value of US$100 million, and the upper end is a value of US$220 million. More importantly, the multiples raise questions about comparability. Are these assets even comparable to each other, much less the subject asset? Why is it assumed that the subject of the valuation is like the middle range of the observed multiples, not the high? Or the low? Although this is a somewhat extreme case, wide multiples ranges are not uncommon and may suggest concerns about the comparability that must be evaluated to ensure a reliable outcome.

Figure 6: Observed multiples from transactions deemed comparable



Truly comparable assets can be difficult to identify. VALMIN explains that '[w]hilst widely used [comparables] are often flawed because companies are not truly comparable as risks and opportunities can be very different between compared projects/companies'.[42] Sometimes there are no good comparables. Even when reasonably comparable assets exist, it may be necessary to make adjustments to the multiple to account for differences. The reasonableness of these adjustments should be addressed case by case, and it is important that they do not mute the valuation signal that makes the market method useful.

In practice, multiples analysis has rarely been accepted by arbitral tribunals in mining disputes. Of 15 mining disputes that found on behalf of the claimant and for which awards are public, claimants in only six cases argued for the use of comparables.[43] The only investment arbitration we are aware of in which a tribunal adopted comparables as a primary valuation method is *Crystallex*, in which the tribunal accepted the claimant's traded comparables analysis. The values of a set of publicly traded gold mining companies were converted into multiples of enterprise value per ounce of gold-equivalent reserves.[44] Although the tribunal recognised the existence of differences between Crystallex and the comparables, it found the differences were not large enough to prevent the use of the method.[45] The claimant also presented multiples for comparable sales transactions. The tribunal concluded that 'in theory such method could yield reasonable results and would thus be an appropriate valuation method to value an investment in an international arbitration . . . [but] the Tribunal cannot consider it in this particular case'.[46] The tribunal found that differences would require adjustments that 'are too plentiful to render this method of reliable value and that the assessment of damages reached through such calculations is too speculative to be taken into account'.[47]

The *Gold Reserve* tribunal relied primarily on a DCF analysis, because it was 'not convinced that the comparables offered are sufficiently similar to enable then to be used in a weighted valuation calculation'.[48] However, the tribunal relied on comparables to find that the DCF submitted by the claimant's expert was reasonable.[49] The other four tribunals disregarded the comparables methods due to lack of comparability.[50]

42 VALMIN Committee, *VALMIN response to the [International Valuation Standards Council] IVSC Discussion Paper*, 11 July 2012, p. 2, https://www.ivsc.org/files/file/download/id/333 (last accessed 2 October 2020).

43 *Copper Mesa Mining Corporation v. Republic of Ecuador*, PCA No. 2012-2; *Crystallex Int'l Corp. v. Bolivarian Republic of Venezuela*, ICSID Case No. ARB(AF)/11/2 [*Crystallex*]; *Gold Reserve Inc. v. Bolivarian Republic of Venezuela*, ICSID Case No. ARB(AF)/09/1 [*Gold Reserve*]; *Khan Resources Inc. et al. v. Gov't of Mongolia & MonAtom LLC*, PCA Case No. 2011-09 [*Khan Resources*]; *Rusoro*; and *South American Silver Limited v. Bolivia*, PCA Case No. 2013-15 [*South American Silver*].

44 *Crystallex*, Award, ¶ 902. Many gold projects produce other metals, such as copper. To adjust for mix differences, some analysts convert reserves of secondary metals into their value equivalent in terms of ounces of gold, or 'gold-equivalent reserves'.

45 *Crystallex*, Award, ¶ 902.

46 id., at ¶ 907.

47 id., at ¶ 909.

48 id., at ¶ 831.

49 id., at ¶ 832.

50 *Copper Mesa*, Award ¶ 7.24; *Khan Resources*, Award, ¶¶ 398 to 399; *Rusoro*, Award, ¶ 782; *South American Silver*, Award ¶ 843.

Use of comparables is less common in upstream oil and gas disputes than in mining disputes. In *Occidental v. Ecuador*, the respondent argued for the use of comparables. The tribunal disregarded comparables and suggested that, more generally, in the upstream oil and gas industry, the uniqueness of each project makes the comparable sales method unreliable:

> *the Tribunal agrees with the Claimants that "each oil and gas property presents a unique set of value parameters". Therefore, the Tribunal concludes that it can derive no assistance from an analysis of the seven transactions which the Respondent has submitted as comparable sales.*[51]

None of these tribunals disputed the validity of using valuation multiples; in fact, many explicitly recognised their legitimacy. The primary concern was the lack of reliable comparables.

P/NAV: A mining industry valuation method

The P/NAV multiple is a hybrid of the income and market methods sometimes used by mining equity analysts to value projects under development. 'P' is price, as measured by the market capitalisation of a publicly traded company, and 'NAV' reflects the company's net asset value, equal to the value of its assets minus its liabilities. The P/NAV ratio therefore reflects the market value of equity in a company relative to its NAV as calculated using a DCF model.

Analysts publish P/NAV multiples for mining companies, particularly those mining gold. In calculating these multiples, analysts will often populate their DCF analysis with generic rather than company-specific assumptions. For example, analysts may use a standard discount rate for all companies (often 5 per cent real), ignore country, social or environmental risk, assume a constant future gold price rather than rely on a forecast of expected gold prices, and make a particular assumption about how to account for the quality of resources and reserves.[52] Although this approach can be useful for facilitating comparisons across assets, the resulting NAV can differ from the company's market capitalisation, creating a P/NAV ratio different from 1.0x.

To estimate the value of the subject project, its NAV is multiplied by the P/NAV ratio from comparable projects, using the same approach illustrated for valuation multiples above. The P/NAV method has been applied by claimants in *Crystallex* and *Gabriel Resources*.[53] We are not aware of any tribunal that has made an award based on it.[54]

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51 *Occidental Petroleum Corp. & Occidental Expl. And Prod. Co. v. Republic of Ecuador*, ICSID Case No. ARB/06/11, Award, ¶ 787, 5 October 2002.

52 See, e.g., BofA Merrill Lynch, *Global Gold & Precious Metals*, 9 April 2013, https://www.merrilledge.com/publish/content/application/pdf/gwmol/GlobalGoldandPreciousMetals.pdf, (last accessed 2 October 2020), pp. 93 to 94; Ernst & Young LLP, *Golden Queen Mining Co. Ltd. Formal Valuation and Fairness Opinion*, 5 April 2019, p. 18, https://www.sec.gov/Archives/edgar/data/1025362/000127956919000874/tv518695_ex99-1.htm, (last accessed 2 October 2020).

53 *Gabriel Resources Ltd et al v. Romania*, ICSID Case No. ARB/15/31, Claimants' Memorial, 30 June 2017, ¶¶ 922 to 993, https://www.italaw.com/sites/default/files/case-documents/italaw9821.pdf.

54 The *Crystallex* tribunal rejected the P/NAV method as implemented, but stated that: 'the Tribunal considers that conceptually it would have no difficulties in accepting it as a method per se'. See *Crystallex*, Award, ¶ 896.

Like other valuation multiples, P/NAV multiples reflect the effects of risks (e.g., geological, permitting, technology, country, price) of the comparable projects. The method assumes that the risks of the project being valued are similar. Comparable assets must therefore be selected with careful attention to risk. Using P/NAV multiples from projects with different risk profiles will generate unreliable results. If the information is available to assess the comparability of risk, a DCF analysis may often be feasible and a better choice, given that the P/NAV method already requires sufficient information to generate cash flows projections and the DCF can better capture the unique aspects of a project.

Direct market evidence of the asset's value

In some cases, it is possible that an observed market value is available for the subject asset itself. It may be publicly traded or have been valued in a prior transaction. These values may provide objective information about its FMV and damages.

Share prices often represent an objective measure of market value. They can be used to estimate a company's market capitalisation and enterprise value. The resulting valuation may be a reliable basis for estimating damages when the investment at issue is a large component of the claimant's business, share prices reflect relevant and available information, there is no significant information not disclosed publicly, and it is possible to isolate the effects of alleged violations that give rise to the claims.

Tribunals have recognised the validity of information provided by a claimant's own share prices. In *Khan Resources v. Mongolia*, the tribunal found this method to be more reliable than DCF and comparables:

> *The market capitalisation approach advocated by the Respondents on its face has much attraction. The Tribunal accepts that Khan Canada ultimately held the investment that is the subject of this dispute and that it was essentially a 'single-project' company. The market capitalisation of Khan Canada should, therefore, reflect the market's (i.e., a willing buyer's) view of the value of the company and its interest in the Dornod Project . . . Absent countervailing factors, this should be the simplest and most accurate reflection of the value of the Claimants' interest in the Dornod Project and is preferable to the approximations and estimations provided by the DCF and market comparables methodologies.*[55]

55 *Khan Resources*, Award on the Merits, ¶¶ 400 to 401 (citations omitted), 2 March 2015. The tribunal in *Crystallex* reached a similar conclusion; *Crystallex*, Award, ¶ 890.

Prior transactions in the subject asset may also provide evidence of an asset's FMV. The tribunal in *Bilcon v. Canada*, a dispute about the proposed Whites Point aggregates quarry, relied on the evidence from past transactions of the project itself:

> *In establishing the value of the opportunity lost by the Investors in the present case . . . the Tribunal has the benefit of being able to refer to certain past transactions made in relation to the Whites Point Project site, which allow it to establish an implied value range of the investment opportunity presented by the Whites Point Project, as it was seen by economic operators at different points in time.*[56]

The reliability of this evidence will depend, in part, on the extent to which changes after the transaction date can be reflected in the FMV at the valuation date. During the interim period, for example, value could be affected by changes in market conditions or the project's status, such as the receipt of permits, resolution of geological uncertainty and progress in construction. In *Bilcon*, there were no material changes to project status. The tribunal therefore relied on prices from prior transactions and adjusted for trends in industry asset values over time.[57]

Failing to account for important changes in the asset's status or the market environment will generate an unreliable outcome. In *Tethyan*, respondent's expert proposed to adjust the claimant's 2006 acquisition price to the valuation date in 2011. This involved accounting for changes in market conditions and country risk during the interim period.[58] The tribunal found this method reasonable in concept, stating that the 'approach to value the project based on a past transaction involving the very same project might generally appear plausible'.[59] However, the tribunal rejected the method, because it failed to account for the fact that 'considerable changes affecting the value of the project occurred' between 2006 and 2011, such as the favourable outcomes from the claimant's significant development efforts.[60]

Conclusion

The natural resource extraction sector is characterised by large projects, often of strategic importance to the parties involved, that can give rise to substantial claims. Although the overall valuation approaches on which experts rely are the usual income, market and cost approaches, their reliable application to extractive projects requires an understanding of the industry-specific factors that drive each project's cash flow potential, the associated risks and opportunities, and the existence of well-developed commodity markets that can provide market-based inputs into damages analyses that are not always available in other industries.

56 *Bilcon of Delaware et al v. Government of Canada*, PCA Case No. 2009-04, Award on Damages, ¶ 289 (citations omitted), 10 January 2019 [*Bilcon*].

57 *Bilcon*, Award on Damages, ¶¶ 295, 297, 298 and 302. The tribunal also recognised the need to adjust an offered purchase price downwards because it was conditional on receipt of permits that had not been granted by the valuation date.

58 *Tethyan*, Award, ¶ 1695. Specifically, the adjustments were for changes in metals prices, global mining costs, the cost of capital for metals mining, and Pakistan's country risk.

59 *Tethyan*, Award, ¶ 1725.

60 id., at ¶¶ 1726 to 1739.

The most appropriate valuation method or combination of methods for any particular case will naturally depend on the specifics of the project involved. Nevertheless, considering the nature of the assets involved and the information typically available, our experience and review of arbitral awards suggests that the income approach is frequently relied on by experts and tribunals because it can often best capture the unique aspects of the investment at issue in many of these cases. The market approach is sometimes useful, but its applicability may be limited by the lack of similarity across projects. The cost approach has been employed by tribunals in some instances, but its economic relevance is limited when damages are based on the FMV standard because the FMV of extractive projects is insufficiently correlated with spending on exploration and development.

Appendix 1

About the Authors

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Darrell Chodorow is a principal at The Brattle Group with more than 25 years of experience. He has provided written and oral expert testimony in arbitrations before AAA, BCCC, ICDR, ICSID, ICC, LCIA, PCA and ad hoc tribunals, as well as in US state and federal courts. He has served as a damages and valuation expert in disputes involving investment treaties, commercial contracts, M&A transactions, intellectual property, insurance claims, construction delay and alleged anticompetitive activity. These disputes cover a wide variety of industries, but he has extensive experience in energy and natural resources, including the electricity, mining, oil and gas, and pulp and paper sectors. His experience includes work advising on economic issues in regulation and market design of energy markets on behalf of utilities, regulators and governments. *Who's Who Legal*'s guides have identified Mr Chodorow as a leading expert witness in arbitration, quantum of damages and construction – quantum and delay. He holds an MBA from Yale University and a BA in economics from Brandeis University.

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Florin Dorobantu is a principal at The Brattle Group who specialises in valuation and damages analyses in international arbitration. He has provided written and oral expert testimony before ICSID, the ICC and the PCA. He has also advised clients in ICSID, ICC, LCIA and PCA arbitration proceedings, as well as in litigation matters in US and Canadian courts. *Who's Who Legal: Mining* recognised him as an expert in mining and *Who's Who Legal: Consulting* identified him as a future leader in the area of quantum of damages.

Dr Dorobantu has extensive experience in conducting complex lost profits and discounted cash flow analyses, including building cash flow forecasts, estimating the impact of business and financial risks on cash flows and discount rates, and incorporating the value of real options in the valuation of long-lived assets. He has performed valuation and damages analyses in a variety of industries, including mining, oil and gas, construction, telecommunications, financial services, consumer goods and business process outsourcing. He holds a PhD in economics from Duke University and a BA in economics and business administration from the American University in Bulgaria.

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