

Effective Tax Rate for Mining 2022



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Overview

This report provides an analysis of the current Effective Tax Rate (ETR) for Mongolia and 16 of its peers. Modeling shows that while Mongolia's Corporate Tax Rate of 25% is low relative to its peers, the country's very high Royalty Rate and its policy of not refunding VAT credits on capital expenditures results in an ETR (at the Start-of-Exploration Stage) of ~60% for copper projects and ~47% for gold projects, making it one of the highest amongst its peers.

Detailed modelling shows that the current value of Mongolia's mining industry is maximized at an ETR of 25 to 35% - which is well below the current rate charged. In addition to adjusting the tax rules, the Government can unlock significant additional value by putting in-place programs that lower the cost of discovery and (more importantly) lower the level of perceived business risk.

Doing so will result in Mongolia joining the same league as the established mining countries of Australia, Canada and the United States.

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Executive Summary

This paper calculates the **Effective Tax Rate (ETR)** that maximises the Mongolian Government's return from the mining industry.

Each country has its own complex set of tax, Royalty and investment rules. The ETR provides a mechanism for comparing these countries on a single common basis. The approach used to calculate the ETR (for Mongolia and its peers) involves quantifying the various cash flows captured by the Government from the current set of tax rules and then, with this, back-calculate a single notional corporate tax rate that gives the same net present value.

With regard to Mongolia, Figure 1 clearly shows that its Corporate Tax Rate of 25% is one of the lowest amongst its peers. However, with an Effective Tax Rate of ~53% for copper Mongolia compares unfavourably against the average ETR of ~41% for copper projects at the Decision-to-Build Stage in the other 16 countries surveyed¹. A similar situation applies for gold projects – with an ETR of around 43% (versus 39% for its peers). In both cases, Mongolia's Effective Tax Rate is ranked in the fourth quartile of its peers.



Figure 1. Effective Tax Rate for a Copper Project in Various Countries

¹ It should be noted that the ETR varies with the stage of development chosen. For example, the ETR for an open pit copper project in Mongolia at the Decision-to-Build Stage is calculated to be 51.7%, rising to 52.4% at the Start-of-Feasibility and 53.1% at the Start-of-Exploration. The average ETRs for Mongolia's 16 peers are 41.5%, 41.9% and 42.4% respectively.

The above analysis was based on modelling two hypothetical projects (one open pit and the other underground) of arbitrarily chosen tonnes & grade. Of concern is that these may not be representative of the universe of projects available in Mongolia. The solution was to model the economics of 292 copper and 856 gold deposits² found in the World since 1995. The underlying assumption is that the next generation of discoveries to be found over the next 25 years will have similar tonnes & grade characteristics to that found in the previous 25 years.

Modelling work shows that, depending on the ETR and Hurdle Rate³ used, less than 20-40% of all discoveries are economic to develop. As the tax rate increases, fewer projects get developed, and the Government is at risk of destroying value. At the extreme, setting the tax rate at 100% will result in no projects being developed, resulting in zero value being generated to either industry or Government. Conversely an ETR of 0% will greatly stimulate the development of many new mines resulting in a very large and profitable sector for the companies involved. However, the Government will get none of the value-created from this (though, in practice, it will capture some value indirectly from taxes on wages and services to the mines). Intuitively, between the two extremes there is a tax rate that maximises the value of the industry to Government; this called is the **Optimum Tax Rate**.

Figure 2 shows the how the value created from the mining sector varies with the tax rate, and how much revenue is captured by the Government (both directly and indirectly). Using a Hurdle Rate of (say) 10%, at the Decision-to-Build stage the Government's revenues from copper projects is maximised at an ETR of around 52 to 57%.

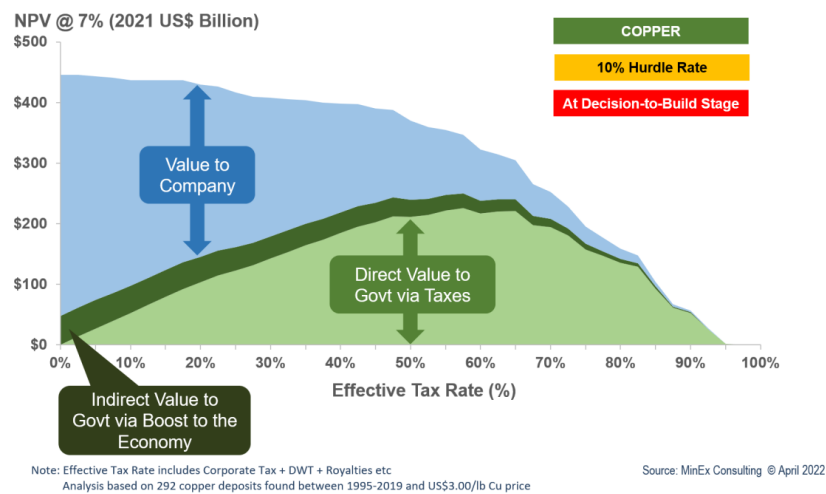


Figure 2. Effect of Tax Rate on the Distribution of Wealth for Copper Projects found in the World: 1995-2019

² This includes a mix of open pit and underground deposits.

³ The **Hurdle Rate** is minimum acceptable return required by the company for it to advance the project to the next stage (and ultimately to production). It is typically set at 1-5 percentage points above the Company's risk-adjusted cost of capital. For purposes of this study a Company Hurdle Rate of 10% was used to evaluate projects in Low-Risk countries, 15% in Medium-Risk countries and 20% for High-Risk countries.

Detailed modelling found that the Optimum Tax Rate varies with the commodity type, business risk and stage of development. The key results are summarised below.

Table 1. Optimum Effective Tax Rate by Commodity, Development Stage and Business Risk

Hurdle Rate	Start-of-Exploration	Start-of-Feasibility	Decision-to-Build
COPPER PROJECTS			
10%	40 to 50%	50 to 55%	52 to 57%
15%	35 to 50%	45 to 50%	47 to 52%
20%	25 to 35%	40 to 45%	42 to 47%
25%	25 to 35%	38 to 43%	39 to 44%
GOLD PROJECTS			
10%	45 to 50%	65 to 70%	67 to 72%
15%	35 to 40%	57 to 62%	60 to 65%
20%	25 to 35%	50 to 55%	50 to 60%
25%	20 to 30%	48 to 53%	47 to 57%

Source: MinEx Consulting © April 2022

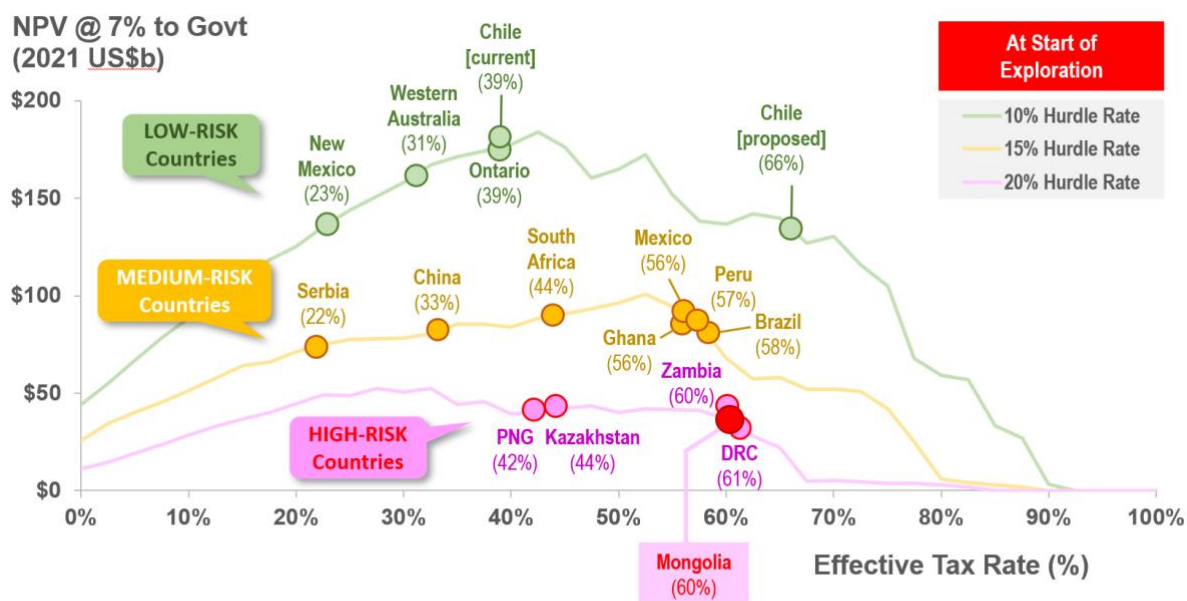
With regard to Mongolia, foreign investors view it as a high-risk jurisdiction, and would use a Hurdle Rate of around 20%.

The decision on which starting point to use (i.e. from Start-of-Exploration, Start-of-Feasibility or Decision-to-Build) will be influenced by the country's mineral potential. If it is mature (i.e. there are limited opportunities to find significant new deposits) then the best option for the Government is to maximise its returns at the Decision-to-Build stage (i.e. a so-called strategy of "milking the cows"). If there is a large inventory of late-stage exploration projects yet to be evaluated, the preferred option will be to maximise the returns at the Start-of-Feasibility (i.e. a strategy of "maintaining the current herd of cows"). Finally, if the country has good potential for additional new discoveries, which is what the author believes is the case for Mongolia, then the Government's preferred option would be to maximise the returns at the Start-of-Exploration (i.e. "grow the herd of cows"). **Consequently, the best option for Mongolia is to maximise the returns at the Start-of-Exploration. On this basis, the Government should set the Effective Tax Rate at 25 to 35%** (see Table 1 above).

It is significant to note that (at the Start-of-Exploration) the current ETR of ~53% for copper projects in Mongolia lies well above the corresponding Optimum ETR of 25% to 35%. A similar situation also applies for gold exploration projects - with an ETR of 43% versus an Optimum ETR of 25 to 35%.

From the above it is clear that the tax rate for copper and gold projects in Mongolia is currently set at a level that is too high to grow the local mining industry.

Mongolia's ETR was benchmarked against 16 of its peers. The key results, sorted by business risk are shown in Figure 3, which shows that several countries are clustered around their Optimum Tax Rate. However, because of its high-business risk, Mongolia is missing out on the opportunity to extract the same value from the industry as the low-risk countries like Canada or Australia.



Note: Effective Tax rate includes Corporate Tax + Royalties + Tax Holidays etc
 Based on modelling the economics of 292 copper deposits found in the World between 1995-2019
 The Company's Decision-to-Build is based on \$3.00/lb Cu price
 Feasibility Study cost is 7% of initial Capex spread over 3 years
 Exploration cost is 2.1c/lb Cu-eq spread over 5 years

Source: MinEx Consulting © April 2022

Figure 3. Effective Tax Rates of Selected Countries versus NPV to Government for Copper Projects at the Start-of-Exploration

As schematically shown in Figure 4, Governments can maximise the value of their mining sector by completing the following four steps:

1. Adjust the current tax rate to line-up with the optimum ETR (of 25-35%)
2. Lower the cost of discovery (as this will improve project economics)
3. Lower the level of perceived business risk for the country
4. Re-optimize the ETR to reflect the prevailing lower level of business risk

The third factor has the largest impact.

Doing so will result in Mongolia joining the same league as the established mining countries of Australia, Canada and the United States. In the process it could double the size of its mining industry and capture triple the available value.

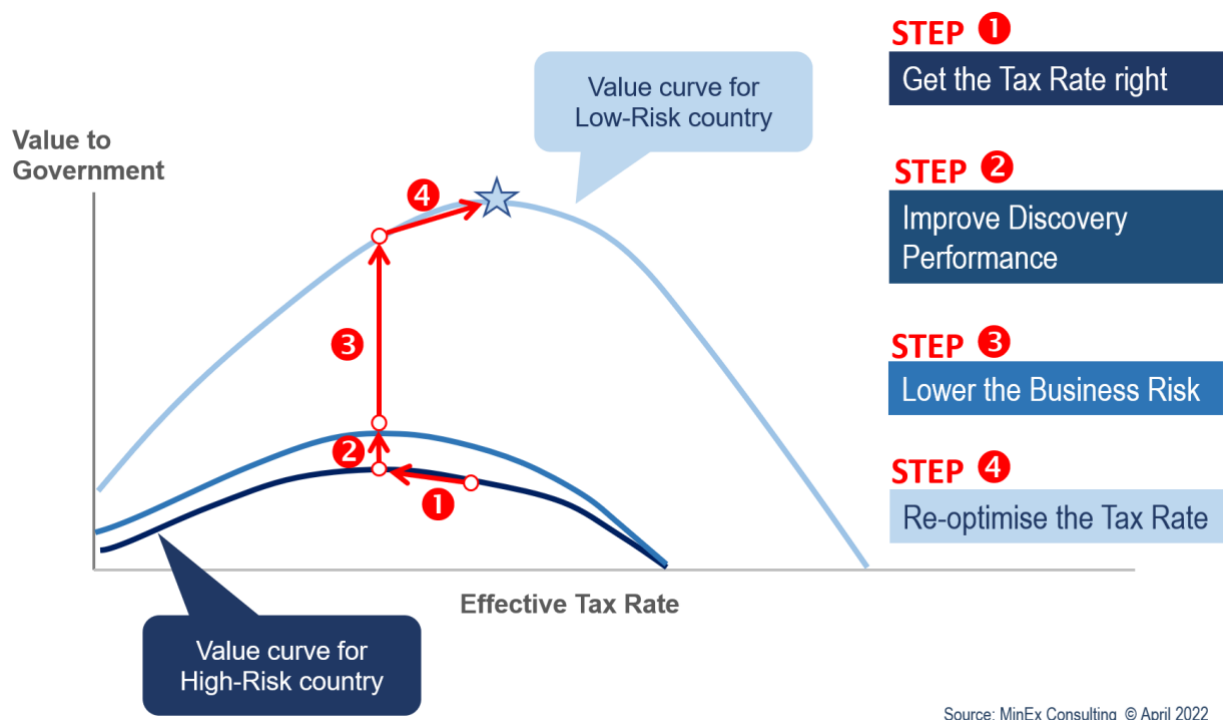


Figure 4. Steps required by Government for Maximising the Value of Mining

Context and Purpose of the Study

In 2018 the Australia-Mongolia Extractive Program (AMEP) was jointly set up by their respective Governments with the objective of enabling Mongolia's citizens to equitably and sustainably benefit from the development of the country's mineral resources. This involved providing policy advice and technical expertise.

The Program is now in its second Phase of work – with the main focus of AMEP 2 involving Government, civil society and the private sector collaborating together to improve the business environment for domestic and foreign companies investing in the extractives sector in Mongolia.

AMEP 2 is funded by the Australian Government's Department of Foreign Affairs and Trade (DFAT) with the various programs being implemented by Adam Smith International (ADI).

Adam Smith International is a global advisory company that works locally to transform lives by making economies stronger, societies more stable, and governments more effective. ADI is headquartered in London and offices in Washington DC, Sydney, Amsterdam, New Delhi and Nairobi.

In 2021 ADI commissioned Minex Consulting Pty Ltd (MinEx) to carry out a study to identify the current Effective Tax Rate for mining companies in Mongolia and then determine what the optimum rate should be.

The impetus for this study was that a recent international survey of mining companies (Fraser Institute, 2017) that found that Mongolia's current tax regime was one of the top three key negative factors preventing investment in the country's exploration and mining sector. The top two negative factors were concerns over the country's political stability and the legal system.

The challenge is that Mongolia's corporate tax rate of 25% actually compares favourably to many other resource-based countries. For example, the corporate tax rate for Australia, Chile and Canada is 30%, 27% and 23-31% respectively. The apparent inconsistency may be due to the mining companies and investors looking at the total package of tax rules (such as Royalties, Withholding Taxes and Depreciation rates etc.) for determining where best to invest.

To assess what the "true" tax rate is, MinEx modelled the tax & investment rules of 16 different mining-jurisdictions with a basket of real-life mining projects to determine (and rank) their "effective" tax rates. These countries were chosen on the basis of their mining history (for both copper and gold) and to provide a broad range of different country-risks.

The study also looks at the impact of country-risk on the investment decision. Combining the two elements together, it is possible to estimate the Optimum Effective Tax Rate which maximises the overall value of the mining industry to the Country as seen by the Government.

Definition of the Effective Tax Rate

As noted before, Corporate Income Tax is only of many taxes and charges levied on a given mining project. These include, but not limited to:

- **Corporate Income Tax** - levied at the National level
- **State & Provincial Income Tax** – levied at the State or Provincial level
- **Dividend Withholding Tax** – levied on profits sent outside the host country
- Interest Withholding Tax – levied on the Interest charged on foreign-sourced loans
- **Royalties** – these can be based on revenue (gross or net), operating profits, return-on-equity, or unit-of-production based
- **Import and Export Duties** (on capital goods as well as imported consumable items)
- Licensing and User Fees (such as access to water, right to discharge wastes etc.)
- Land & Property Taxes (based on book or assessed value)
- Payroll Taxes
- **Value -Added Taxes** on operating expenditures
- Stamp Duty on asset sales, Capital Gains Tax on profits made from asset sales

In addition, there may be:

- “hidden” taxes associated with the Government overcharging the company for services provided – such as power, water, transport and port access. In some cases, the company is required to sell its output to Government Agency (at a discount to the free-market price)
- Local purchase requirements – that require the company to use locally-sourced goods, materials, labour or services (which may cost more than foreign-sourced items)
- Local Production requirements - that require the company to sell to local companies and/or compel the company to build downstream processing facilities
- Investment requirements – such as requiring the company to give a **(free-carried) share of the project to the Government** and/or selling equity in the project to local investors

On the other hand, Governments may offer the following tax incentives:

- **Tax Holidays** and exemptions on import duties
- Ability to **carry-forward tax losses** – thereby offsetting profit made in later years
- **Accelerated depreciation rates** – this is a rate that is faster than the useful “life” of the given asset (of say 5 years for mine equipment or life-of-mine for plant and infrastructure capital)
- **Depletion Allowance** – in the United States companies can claim a % reduction in the calculated profit for the depletion of the resource. It is similar to depreciation but is better as the credit doesn’t expire when book value asset is written-off
- **Flow-Thru tax credits for exploration expenditures** – as applicable in Canada

*Note: Those items highlighted in “**Bold**” are captured in MinEx’s tax model. The non-bolded items were excluded on the basis on not being material to the analysis.*

A financial model was built to determine the revenues, costs and associated free-cashflows generated from a given mining project.

The model was then run using the various levies and incentives applicable for a given country. The key output was the Net Present Value (NPV) of the income captured by the Government.

The model was then re-run using a default set of investment rules (where all levies were set to zero) The Corporate Income Tax rate was then adjusted to generate the same NPV to the Government as before. This adjusted rate is called the “Effective Tax Rate” (ETR) for the Country⁴.

Note: For those seeking in-depth information on mining taxation and Royalties, The World Bank has published the following two excellent (and free) books on the subject:

“Mining Royalties: A Global Study of Their Impact on Investors, Government, and Civil Society”, by James Otto, Craig Andrews, Fred Cawood, Michael Doggett, Pietro Guj, Frank Stermole, John Stermole and John Tilton, published by the World Bank, Washington DC, 2006.

A copy can be downloaded from: <https://openknowledge.worldbank.org/handle/10986/7105>

“How to Improve Mining Tax Administration and Collections Frameworks: A Sourcebook”, by Pietro Guj, Boubacar Bocoum, James Limerick, Murray Meaton and Bryan Maybee”, jointly published by The Centre for Exploration Targeting (Perth) and The World Bank (Washington DC) 2013.

A copy can be downloaded from: <https://openknowledge.worldbank.org/handle/10986/16700>

⁴ In other studies, authors Gemell, Sykes & Trench (2016). Bazel, P & Mintz, (2019), have calculated the Effective Tax Rate based on the simple ratio of total taxes to income. In other words, they implicitly used a discount rate of zero. MinEx’s view is that this ignores the impact of timing issues associated with reduced/delayed tax associated with depreciation credits, as well as deferred DWT payments. The discount rate of 7% was chosen to reflect the time value of money to companies and Government.

Methodology used for Calculating the Effective Tax Rate

Key Assumptions used in the Financial Model

The financial model used to calculate the Effective Tax Rate assumes:

- All costs are in constant 2021 US Dollars
- A unit discovery cost for copper projects of 2.1 cents/lb Cu-eq. For gold the unit discovery cost was assumed to be \$50/oz Au-eq. Both rates reflect the current average cost for discovery in the World in recent years (see Appendix B for details)
- Exploration expenditures are evenly spread-out over five years (prior to discovery)
- Feasibility study cost was notionally set at 7% of the initial capital cost. The cost was evenly spread over three years, immediately following discovery
- Construction costs are evenly spread over two years, immediately following completion of the feasibility study
- Mine production rates, capital and operating costs are based on data reported in recent feasibility and scoping studies for large-scale open pit, mixed and underground mines (see Appendix C for details)
- Constant production and operating costs over the life of the mine
- Over the life of the mine, additional capital investment is required each year to sustain the operation. This is set at 5% initial capex cost (excluding infrastructure) for open pit mines and 10% for underground mines
- Shutdown costs at the end-of-the mine life are set at 10% of the initial capital cost (excluding expenditures on infrastructure)
- Depending on the country, an inflation rate of 2 to 9% pa has been used (see Appendix A for details). A high inflation rate adversely affects the value of depreciation credits
- Head grade and ore tonnes mined are based on current reported Resources
- Recovery rates vary with the head grade (see Appendix D for details). Low grade mines have lower recovery rates
- Constant commodity prices – set at US\$3.00/lb Cu and US\$1500/oz Au. These match the average realized price achieved over the last 3 years and are in-line with the long-term price forecasts published by Consensus Economics (2021)
- By-product credits (such as gold and silver contained in the copper ore) are converted into equivalent primary metal. The conversion rate is based on the average price realized over the least 4 years, adjusted for recovery rates and TC&RC charges
- Modelling is done at the project-scale. It ignores the issue of management fees and financing costs / interest charges or sharing of tax credits with other units within the company. i.e. it assumes 100% equity / zero debt financing, nor the use of Corporate Structuring to minimize/delay tax payments
- The owner is foreign-based, and so will pay a Dividend Withholding Tax (DWT) on all profits repatriated overseas. Have assumed that there is a Tax Treaty in-place (so that the Company doesn't pay the default DWT rate)
- A discount rate of 7% real has been used to calculate the Net Present Value (NPV) of the future cashflows, as seen by the Company and the Government.

The financial model also includes an adjustment for any indirect taxes generated from the establishment of a mining operation in-country. These include taxes on the salaries of people employed in the industry and profits generated from the sale of goods and services provided.

The economic benefits that flow from mining are very complex to model and vary from project-to-project. As a first-pass estimate, MinEx has assumed a notional figure of 15% of the operating costs and capital expenditures on infrastructure associated with the project. This is in-line with the reported global average ratio for Taxation versus GDP (see Appendix E for details).

Qualifications

The model assumes a relatively short time-line of ten years between start-of-exploration and start-of-mining. This is very optimistic – as, in practice, can take up to several decades (if at all) to happen. Such delays will materially impact on the economics of exploration.

The estimated mine production rates, capital and operating costs for a given project are (at best) only accurate to +/-25%. No adjustment been made for variations in costs between countries or for individual projects in remote locations and/or under deep cover.

The model is based on MI&I Resources, not P&P Reserves. This generally results in a lower head grade (and reduced production and higher unit operating costs), but a much longer mine-life. The reason for using the Resource number is that for most recent discoveries this is the only data available⁵.

The use of constant real commodity prices doesn't reflect real-life – where prices vary by up to +/-30% in any given year. Extended periods of prices being above the average may trigger marginal (uneconomic) mines to be developed. Also, in some countries, the Royalty Rate varies with the commodity price (such as is the case in Chile and Mongolia) and Operating Margin (as is the case in Ontario, Nevada and South Africa). Consequently, the Government's share of the revenues calculated in the model may be underestimated.

The model assumes that the project owner is based overseas. In practice the owner may be a local company (particularly so in large established mining jurisdictions such as Australia, Canada, China, South Africa and USA) and so is not required to pay a Dividend Withholding Tax. As a result, the Effective Tax Rate in these countries will be lower than that calculated.

The use of a 7% discount rate may/may not match that used by the Government or the Company. In high-risk countries, companies may require much higher returns. Conversely, in low-risk countries, Governments can borrow money at low interest rates will use a more modest discount rate for valuing future revenues. The 7% figure was chosen as a common starting point for comparing the split in the project's value between the company and the Government and comparing projects in different countries. The 7% rate reflects the typical cost of capital for companies building new mines in low-risk countries.

⁵ Under JORC and CIM guidelines, Companies have to demonstrate that the project is economically viable in order to publish a Proven & Probable Reserve figure. This requires completing a feasibility study.

Effective Tax Rate – Modelling Results

The following four hypothetical mines were modelled:

	Tonnes & Grade	Mining Rate [Mt pa ore]	Recovery Rate	Capex Cost [2021 US\$m]	Opex Cost [2021 US\$/t ore]
COPPER					
Open Pit	500 Mt @ 0.8% Cu-eq	25.5	94.1%	\$1027m	\$13.35
Underground	500 Mt @ 2.0% Cu-eq	7.8	91.2%	\$1425m	\$35.27
GOLD					
Open Pit	60 Mt @ 1.2 g/t au-eq	4.1	88.3%	\$264m	\$24.75
Underground	10 Mt @ 8 g/t Au-eq	0.70	97.4%	\$294m	\$107.83

The production rates, costs and recovery rates are as per the trend data given in Appendices C and D. The copper and price used was \$3.00/lb Cu and \$1500/oz Au respectively.

17 different jurisdictions were chosen (see Appendix A for details of their tax & investment rules), including Mongolia.

Three different Cases were evaluated to assess the effect of changing the starting-point of the analysis on the project's IRR, NPV and, from this, the Effective Tax Rate. These were:

- **At Start-of-Exploration:** This is 10 years prior to mine start-up and includes expenditures on exploration, feasibility studies as well construction costs and subsequent mine production
- **At Start-of-Feasibility:** This is 5 years prior to mine start-up and includes expenditures on feasibility studies as well construction costs and subsequent production. It ignores prior expenditures on exploration (i.e. these are “sunk” costs)
- **At Decision-to-Build:** This is 2 years prior to mine start-up and includes expenditures on construction costs and subsequent production. It ignores prior expenditures on exploration and feasibility studies (i.e. these are “sunk” costs)

The results for copper and gold are given in Tables 2 and 3. The key results for the Decision-to-Build Case are plotted in Figures 5 and 6.

As highlighted in Figures 5 and 6, in most cases the estimated Effective Tax Rate (ETR) is typically 5 to 15 percentage points higher than the reported Corporate Tax Rate. The outliers are the US States (of New Mexico and Nevada) where the ETR is lower. This is due to the availability of a depletion allowance⁶. New Mexico also has the added benefit of a low Royalty rate of 1.1% NSR.

At the opposite end, the proposed new Royalty on copper in Chile (which varies from 3% to 75% NSR, depending on the copper price) results in the company paying 2x the corporate tax rate.

With regard to Mongolia, Figures 5 and 6 clearly show that its Corporate Tax Rate of 25% puts it in the lower quarter of the countries surveyed. However, with an Effective Tax Rate of around 40 to 57% (depending on the commodity type, development stage and mining method chosen) Mongolia moves to being in the top half to top one-third of the countries surveyed. By comparison the average ETR across the 16 peer countries was ~39% for copper and ~40% for gold. Mongolia's poor standing is, largely due to its high Royalty Rate. It also affected by the Company's inability to recover VAT paid on the initial capital cost.

A detailed analysis of the data in Tables 2 and 3 show that the project's IRR significantly declines as one goes further back in the development process. This is due to the extra costs and time delays associated with the Feasibility Study and Exploration steps. As a result, there is a risk that the project becomes uneconomic - especially at the Start-of-Exploration. Without offsetting tax incentives, companies may stop exploring - thereby endangering the long-term sustainability of the local mining industry.

Qualifications

The current analysis is based on a very limited sample of deposit types.

While the current analysis provides a useful benchmark for Mongolia versus its peers, it should be noted that it doesn't provide guidance on how to determine the optimum tax rate for the industry, or provide robust levers for developing Industry Policies. These are resolved in the next Section of the report.

⁶ Unlike Depreciation credits, which expire when the book-value of the asset is written-off, Depletion credits are generated for all years of the mine's life (assuming it remains profitable).

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Source: MinEx Consulting © April 2022
 Note: Open Pit Mine is based on 500 Mt @ 0.8% Cu-eq, Mining Rate = 15.5 Mtpa Ore, Capex Cost of \$1027m, Opex Cost = \$13.36/t Ore
 Underground Mine is based on 500 Mt @ 2.0% Cu-eq, Mining Rate = 7.8 Mtpa, Capex Cost = \$1425m, Opex Cost = \$35.27/t Ore
 Average price of US\$3.00/lb Cu, Exploration Cost = 2.1 c/lb Cu-eq spread over 5 years, Feasibility Study Cost = 7% of Initial Capex spread over 3 years

Table 3. Project Returns and Effective Tax Rates for a given Open Pit & Underground Gold Project at various stages of Development

		Mongolia	Western Australia	Ontario	Nevada	Chile (current)	Chile (proposed)	Peru	Mexico	Brazil	Ghana	South Africa	Serbia	China	Kazakhstan	DRC	PNG	Zambia
Corporate Income Tax Rate	[%]	25.0%	30.0%	26.5%	21.0%	27.0%	27.0%	44.5%	30.0%	34.0%	35.0%	28.0%	15.0%	25.0%	20.0%	30.0%	30.0%	30.0%
OPEN PIT MINE AT DECISION-TO-BUILD STAGE																		
Project IRR (a-tax)	[%]	14.7%	17.5%	22.1%	16.0%	20.5%	NA	12.1%	16.6%	13.5%	15.9%	18.0%	23.8%	17.6%	19.5%	18.3%	18.8%	12.1%
Project NPV @ 7%	[2021 \$m]	\$170	\$208	\$295	\$189	\$267	NA	\$88	\$210	\$142	\$161	\$203	\$347	\$223	\$250	\$214	\$233	\$105
Govt NPV @ 7%	[2021 \$m]	\$443	\$377	\$313	\$410	\$348	NA	\$507	\$409	\$435	\$488	\$411	\$280	\$395	\$385	\$433	\$398	\$510
Effective Tax Rate	[%]	46.4%	36.4%	26.7%	41.4%	32.0%	NA	56.1%	41.3%	45.2%	53.2%	41.6%	21.7%	39.1%	37.6%	44.9%	39.6%	56.6%
OPEN PIT MINE AT START OF FEASIBILITY																		
Project IRR (a-tax)	[%]	13.1%	15.8%	19.8%	14.2%	18.1%	NA	10.9%	14.8%	12.1%	14.0%	16.1%	21.2%	15.8%	17.2%	16.2%	17.0%	10.7%
Project NPV @ 7%	[2021 \$m]	\$121	\$156	\$227	\$135	\$201	NA	\$60	\$154	\$99	\$115	\$152	\$266	\$166	\$186	\$158	\$177	\$69
Govt NPV @ 7%	[2021 \$m]	\$364	\$306	\$255	\$338	\$286	NA	\$410	\$336	\$357	\$400	\$335	\$230	\$323	\$317	\$356	\$323	\$418
Effective Tax Rate	[%]	47.4%	36.4%	26.7%	42.5%	32.6%	NA	56.2%	42.1%	46.1%	54.3%	41.9%	22.0%	39.6%	38.5%	45.9%	39.6%	57.7%
OPEN PIT MINE AT START OF EXPLORATION																		
Project IRR (a-tax)	[%]	6.0%	7.4%	10.8%	6.5%	7.8%	NA	4.2%	6.7%	5.1%	5.6%	7.3%	10.3%	7.1%	7.7%	6.8%	8.0%	4.2%
Project NPV @ 7%	[2021 \$m]	-\$25	\$9	\$87	-\$12	\$23	NA	-\$59	-\$8	-\$49	-\$33	\$7	\$88	\$3	\$19	-\$5	\$24	-\$69
Govt NPV @ 7%	[2021 \$m]	\$287	\$234	\$170	\$265	\$242	NA	\$308	\$274	\$291	\$317	\$254	\$180	\$261	\$255	\$287	\$245	\$332
Effective Tax Rate	[%]	50.7%	36.6%	19.5%	44.8%	38.7%	NA	56.3%	47.2%	51.8%	58.7%	41.9%	22.2%	43.8%	42.2%	50.7%	39.5%	62.7%
UNDERGROUND MINE AT DECISION-TO-BUILD STAGE																		
Project IRR (a-tax)	[%]	22.2%	25.0%	30.7%	24.7%	28.4%	NA	15.7%	23.8%	19.6%	23.4%	24.8%	35.8%	25.9%	28.9%	26.1%	26.9%	19.4%
Project NPV @ 7%	[2021 \$m]	\$407	\$426	\$564	\$450	\$509	NA	\$175	\$441	\$332	\$359	\$401	\$722	\$484	\$534	\$441	\$474	\$310
Govt NPV @ 7%	[2021 \$m]	\$595	\$523	\$430	\$526	\$496	NA	\$791	\$569	\$599	\$699	\$594	\$312	\$528	\$509	\$605	\$556	\$695
Effective Tax Rate	[%]	40.0%	34.2%	26.6%	34.4%	32.0%	NA	56.0%	37.9%	40.3%	48.5%	39.9%	16.9%	34.6%	33.0%	40.8%	36.8%	48.2%
UNDERGROUND MINE AT START OF FEASIBILITY																		
Project IRR (a-tax)	[%]	19.9%	22.6%	27.5%	22.1%	25.0%	NA	14.1%	21.2%	17.7%	20.7%	22.4%	31.6%	23.2%	25.4%	23.1%	24.0%	17.4%
Project NPV @ 7%	[2021 \$m]	\$312	\$333	\$445	\$347	\$397	NA	\$129	\$341	\$253	\$275	\$313	\$570	\$377	\$415	\$341	\$370	\$234
Govt NPV @ 7%	[2021 \$m]	\$489	\$426	\$350	\$434	\$407	NA	\$643	\$468	\$492	\$572	\$482	\$256	\$432	\$418	\$496	\$454	\$570
Effective Tax Rate	[%]	40.6%	34.2%	26.5%	35.0%	32.3%	NA	56.2%	38.5%	40.9%	49.0%	39.9%	17.0%	34.8%	33.4%	41.3%	37.1%	48.8%
UNDERGROUND MINE AT START OF EXPLORATION																		
Project IRR (a-tax)	[%]	9.9%	11.0%	15.0%	10.8%	11.3%	NA	6.2%	10.3%	8.4%	9.2%	10.7%	15.2%	11.1%	11.9%	10.5%	11.8%	8.1%
Project NPV @ 7%	[2021 \$m]	\$99	\$124	\$234	\$127	\$149	NA	-\$21	\$112	\$47	\$68	\$110	\$293	\$141	\$170	\$112	\$151	\$36
Govt NPV @ 7%	[2021 \$m]	\$378	\$320	\$237	\$335	\$332	NA	\$476	\$371	\$391	\$442	\$361	\$199	\$342	\$331	\$391	\$340	\$444
Effective Tax Rate	[%]	42.4%	34.1%	22.4%	36.3%	35.8%	NA	56.3%	41.4%	44.2%	51.5%	40.0%	17.0%	37.3%	35.7%	44.2%	37.0%	51.7%

Source: MinEx Consulting © April 2022

Note: Open Pit Mine is based on 60 Mt @ 1.2 g/t Au-eq. Mining Rate = 4.1 Mtpa Ore, Capex Cost = \$24.75/t Ore

Underground Mine is based on 10 Mt @ 8 g/t Au-eq. Mining Rate = 0.70 Mtpa, Capex Cost = \$294m, Opex Cost = \$107.83/t Ore

Average price of US\$1500/oz Au. Exploration Cost = \$50/oz Au-eq spread over 5 years, Feasibility Study Cost = 7% of Initial Capex spread over 3 years

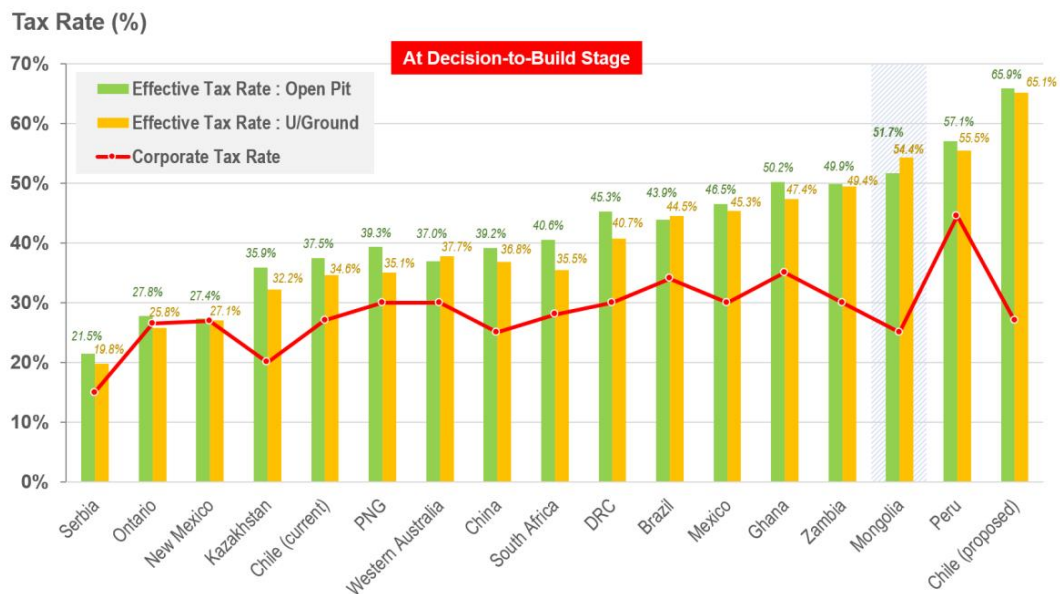


Figure 5. Effective Tax Rate for a Copper Project in Various Countries

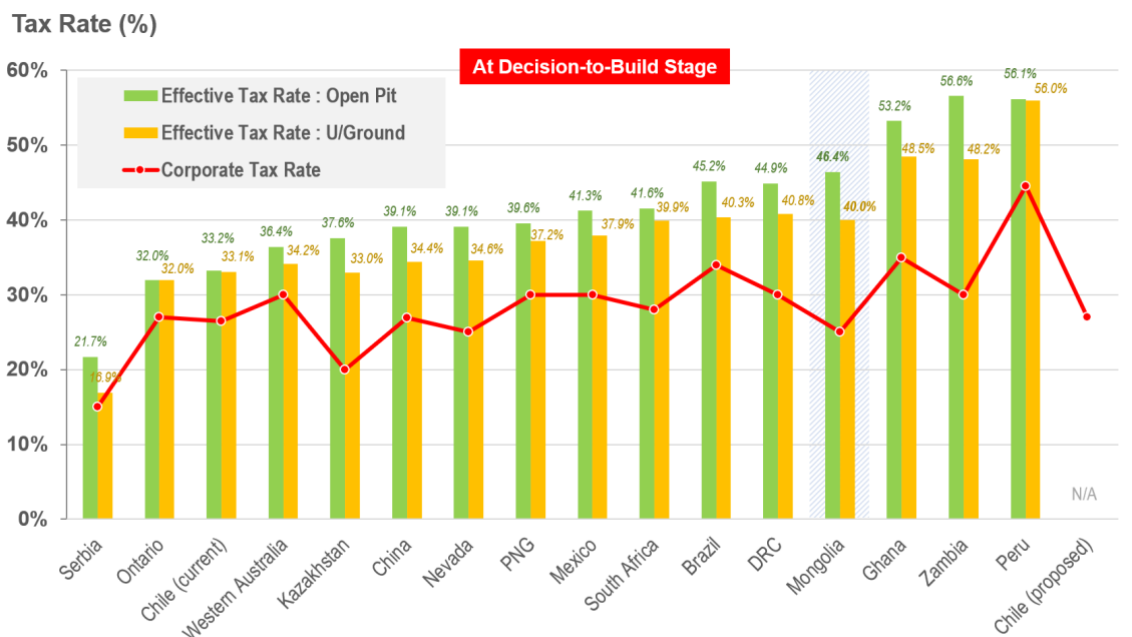


Figure 6. Effective Tax Rate for a Gold Project in Various Countries

Methodology for Calculating the Optimum Tax Rate

In the previous section, the analysis was limited to modelling two deposits (one open pit and one underground) for each commodity. The associated tonnes & grade were arbitrarily chosen and may not necessarily be representative of the universe of deposits available for development. The solution to this problem is simple – model a wider range of deposits. Ideally these should match the current and future generation of available projects. As these deposits vary in size, grade and depth of cover, not all of them will be economic to develop. The number of deposits that do get developed is influenced by the tax and investment rules in-place as well as the level of business risk.

At a tax rate of 100% no projects will be developed, resulting in zero value being generated to either industry or Government. A tax rate of 0% will stimulate the development of many new mines resulting in a very large and profitable sector for the companies involved. However, the Government captures none of the value-created from this. Intuitively, somewhere between the two extremes there is a tax rate that maximises the value of the industry to Government; this called is the Optimum Tax Rate.

Given the above, the following methodology was used to estimate the optimum tax rate:

- Compile a list of deposits that represents the current and next generation of projects available for development. This was based on 292 copper and 856 gold deposits found in the World since 1995 (see Figures 7 and 8)
- Using the algorithms given in Appendices B and C, estimates were made of likely mining rate, recovery rate and capital and operating cost for each deposit
- The production and cost data for each deposit were then fed into a financial model. The model was then run using a Default⁷ set of tax & investment rules for all countries
- The Corporate Tax rate was then varied between 0% to 100%, and from this the cashflow streams to the Government (from taxes) and the Company were determined
- The Internal Rate of Return (IRR) was calculated for the Company's share of the project's cashflow. If this exceeded the Company's Hurdle Rate for investment (notionally set at 10%, 15%, 20% or 25%), the project would proceed
- For those projects that met the Hurdle Rate, the project's cashflow (was discounted at 7% to determine the Net Present Value (NPV) of the Government's share of the cashflow. The NPV's for each viable project were then added together to determine the overall value of the mining sector to the Government. From this it is possible to determine the optimum tax rate required to maximise the Government's NPV from the industry

Figure 9 shows how the break-even grade (at a 30% Effective Tax Rate) varies with the deposit size and Hurdle Rate for open pit copper deposits. A full set of charts showing the break-even tonnes & grade for (open pit and underground) copper and gold deposits can be found in Appendix G.

⁷ The Default (or "Vanilla") set of rules uses a zero rate for Royalties, VAT, Import Duties and Dividend Withholding Taxes etc. It also excluded the benefit of any Tax Holidays or Government Subsidies. The only variable remaining is the Corporate Tax Rate.

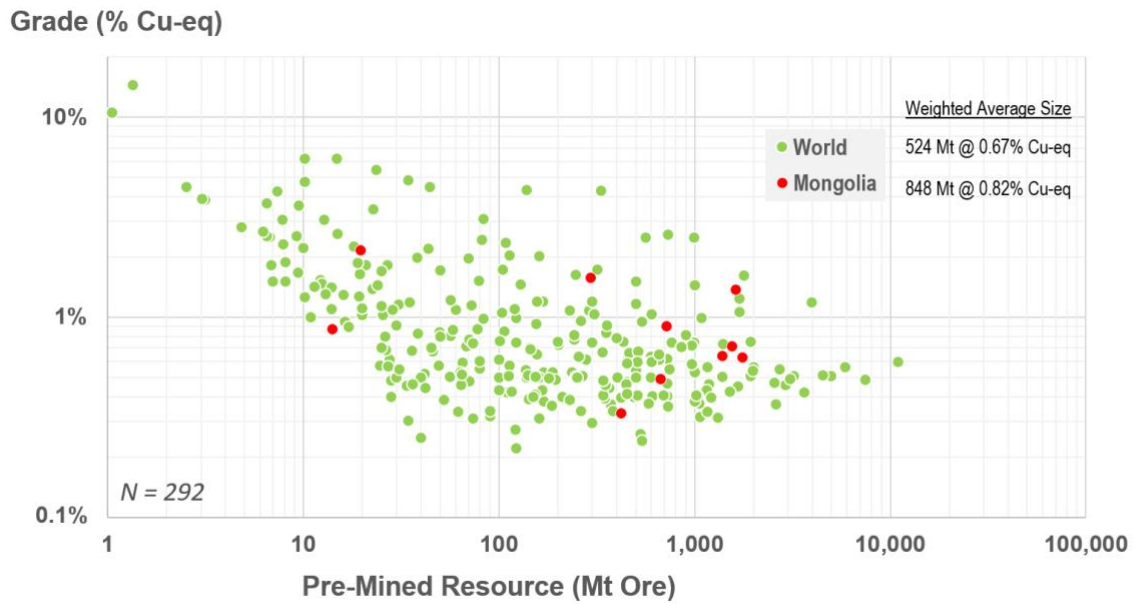
Figure 10 shows the IRR (at a 30% Effective Tax Rate) for the 292 modelled copper deposits, at the Decision-to-Build stage. As can be seen, only three of the ten deposits found in Mongolia (in the last 25 years) exceed the 10% Hurdle Rate.

Figures 11 and 12 show the impact of higher taxes and hurdle rates on the proportion of projects that get developed.

Figures 13 and 14 plot the total value captured by Government and Industry from the 292 copper deposits and 856 gold deposits found in the World since 1995. As can be seen, at low tax rates the majority of the value is captured by the Company. As the tax rate increases, Government's share of the value increases, but at the expense of fewer projects being developed.

In the case of copper, the Government's share is maximised at an Effective Tax Rate of 52-57%. The corresponding Optimum Effective Tax Rate for gold is 67-72%.

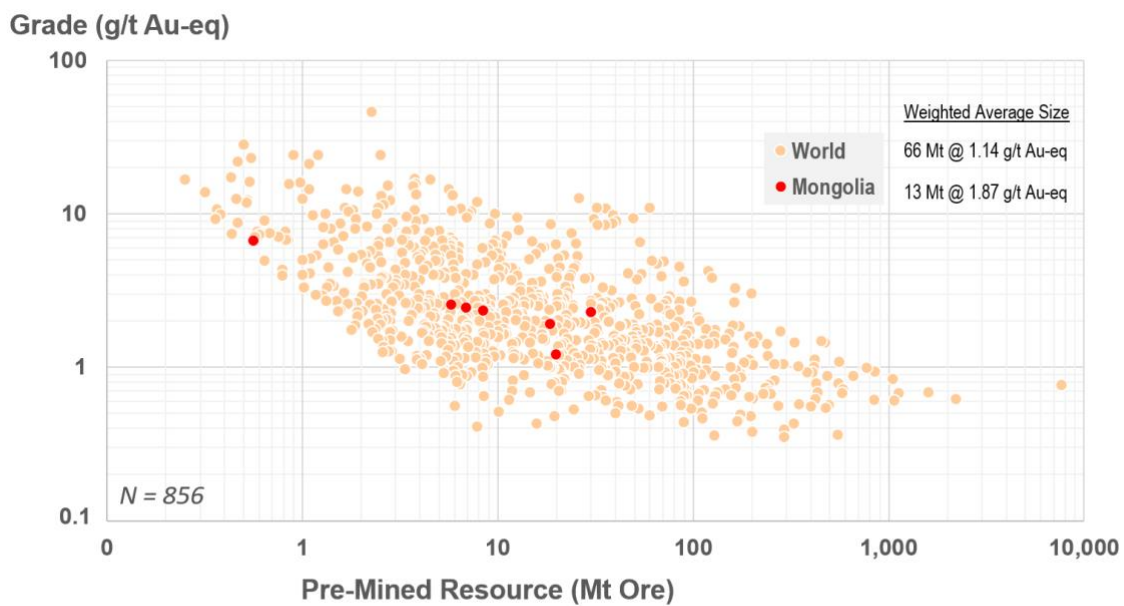
It should be noted that the above optimum tax rates are based on a 10% Company Hurdle Rate and assumes that the project is at the Decision-to-Build stage. As will be discussed in the next Section of the report, the optimum rate varies with the Hurdle Rate and stage of project development.



Source: MinEx Consulting © April 2022

Note: Limited to primary copper deposits containing >0.1 Mt Cu-eq
Have adjusted the copper grade for the value of any credits from by-product metal (such as Au, Ag, Mo etc)

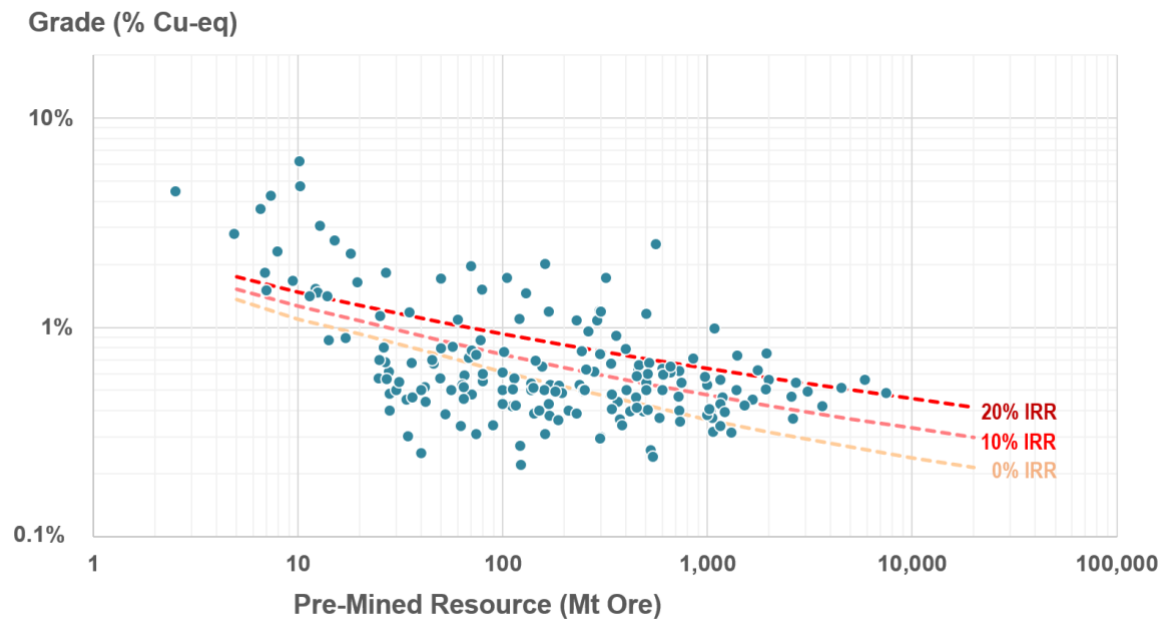
Figure 7. Tonnes-Grade for Copper Deposits found in the World: 1995-2019



Source: MinEx Consulting © April 2022

Note: Limited to primary gold deposits containing >0.1 Moz Au-eq
Have adjusted the gold grade for the value of any credits from by-product metal (such as Cu, Ag etc)

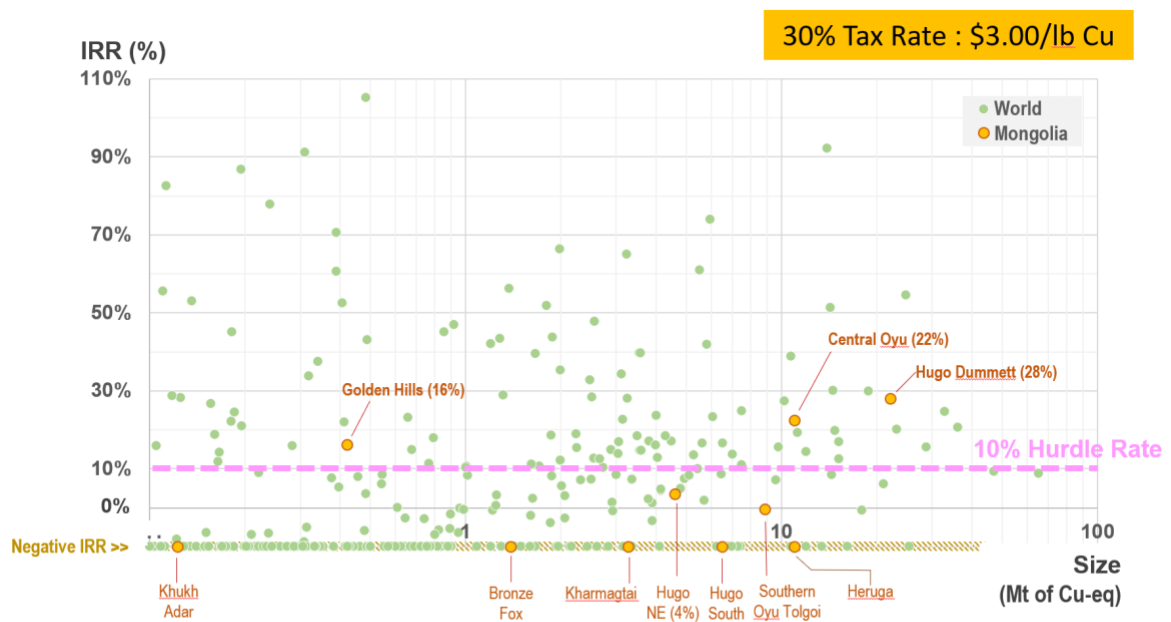
Figure 8. Tonnes-Grade for Gold Deposits found in the World: 1995-2019



Note: Analysis based on 30% Corporate Tax Rate, no Royalties, \$3.00/lb Cu

Source: MinEx Consulting © April 2022

Figure 9. Break-Even Tonnes-Grade for Open Pit Copper Deposits found in the World: 1995-2019



Note: Based on 292 primary copper projects >0.1 Mt Cu found in the World 1995-2019

The 30% Tax Rate ignores DWT, Royalties, Free-Carried interest or Tax Holidays etc

Caution: Calculated IRRs are approximate only – as they based on estimated (not actual) Capex & Opex costs

Source: MinEx Consulting © April 2022

Figure 10. Internal Rate of Return for Copper Projects at the Decision-to-Build Stage

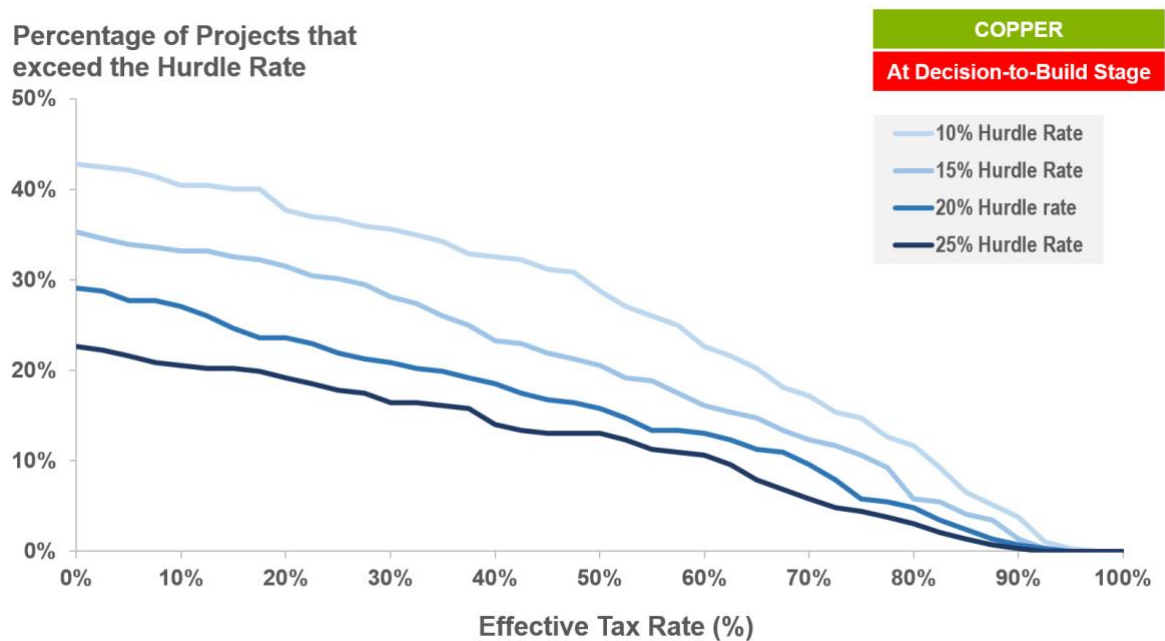


Figure 11. Effect of Tax Rate and Business Risk on the Percentage of Copper Projects that are Economic

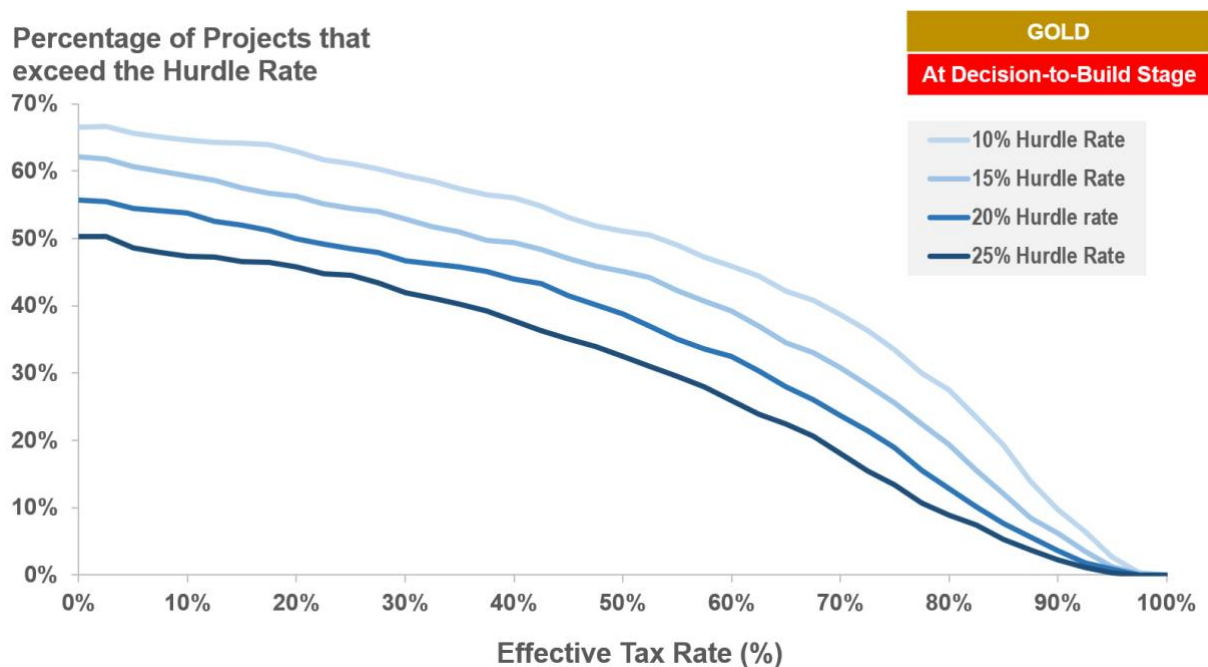


Figure 12. Effect of Tax Rate and Business Risk on the Percentage of Gold Projects that are Economic

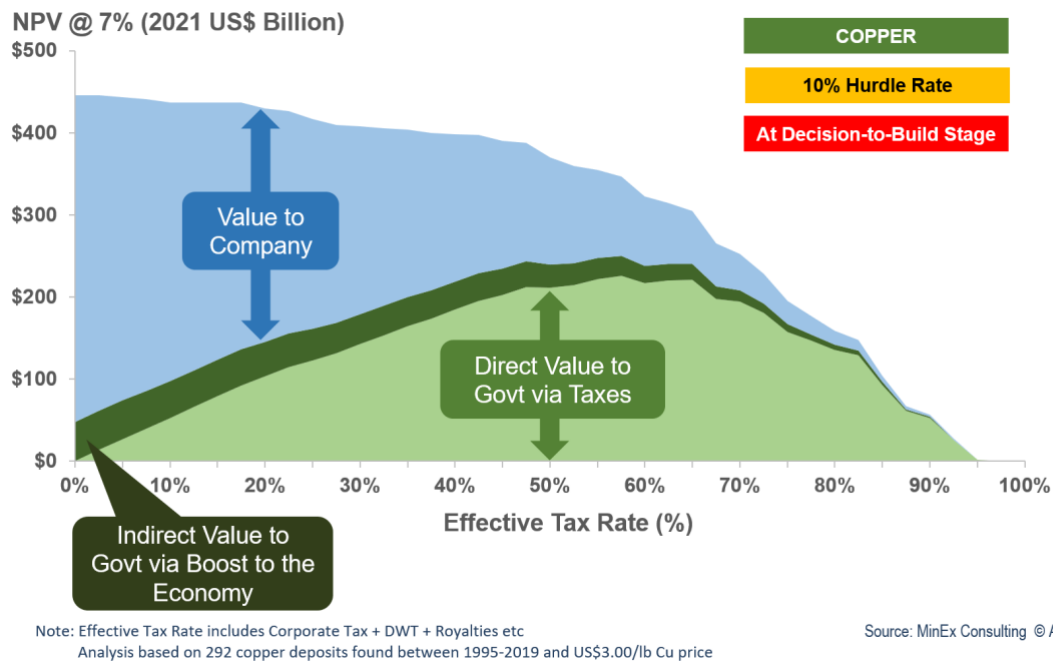


Figure 13. Effect of Tax Rate on the Distribution of Wealth for Copper Projects found in the World: 1995-2019

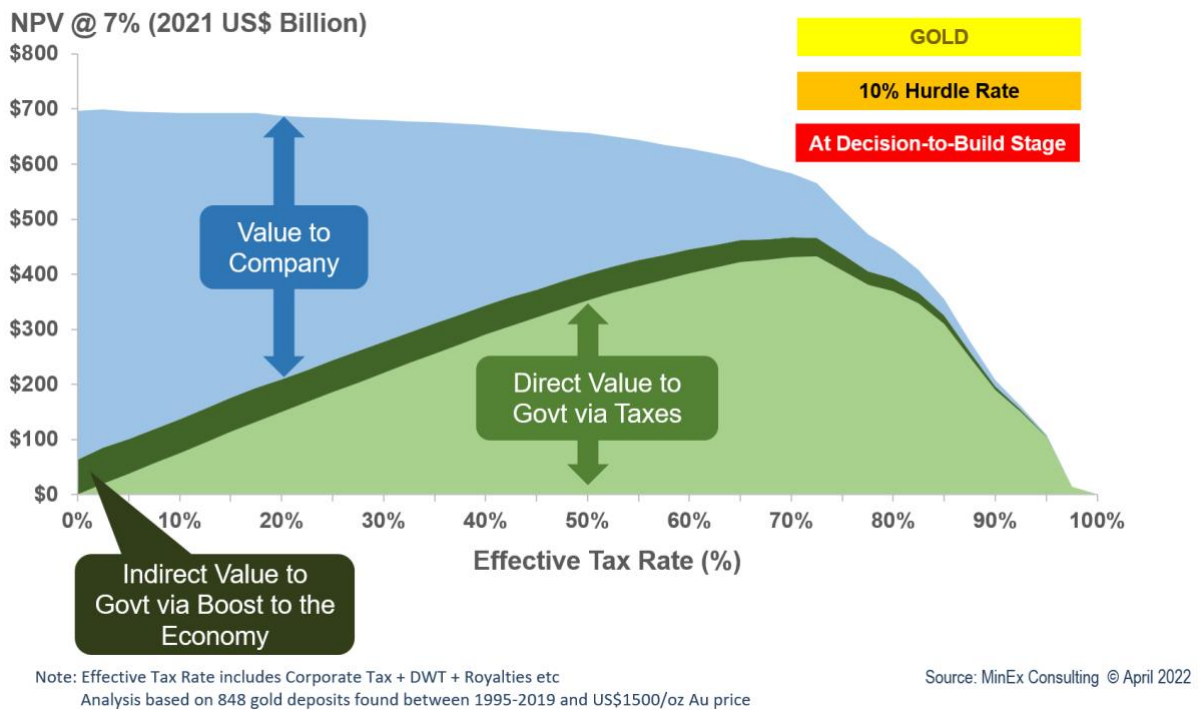


Figure 14. Effect of Tax Rate on the Distribution of Wealth for Gold Projects found in the World: 1995-2019

Optimum Tax Rate – Modelling Results

Figure 15 shows how the value of the copper projects to the Government at the Start-of-Exploration, Start-of-Feasibility and at Decision-to-Build stages.

As can be seen the NPV's for the first two stages are progressively lower than that calculated for the Decision-to-Build stage. More importantly, the optimum tax rate is also progressively reduced. In detail the optimum rate is reduced from 42-47% at the Decision-to-Build stage to 25-35% at the Start-of-Exploration. The two key drivers for this are the extra costs and time delays associated with carrying out exploration and feasibility steps, both of which lower the project's IRR. To compensate the Company for the drop in its return, the Government needs to lower its tax rate.

Figure 16 shows the effect of changes in the Hurdle Rate on the value of copper projects at the start of exploration. Lowering the Hurdle increases the number of projects that are economic and so increases the overall value captured by the Government. The optimum tax rate also increases.

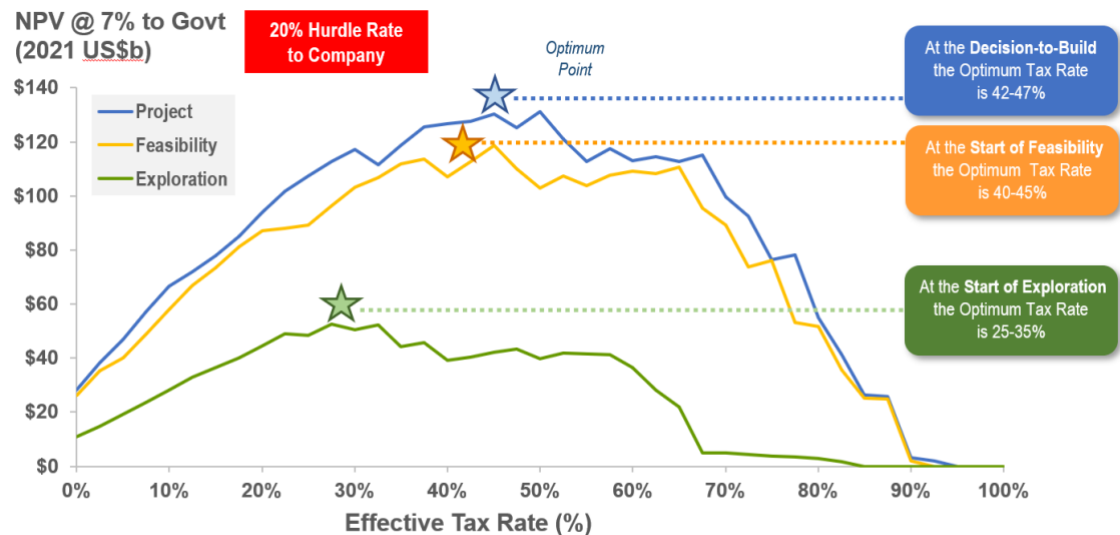
A similar trend (towards an optimum lower tax rate at earlier stages and higher hurdle rates) is observed for gold projects. See Appendix G for further details.

The key results are summarised below:

Table 4. Optimum Effective Tax Rate by Commodity, Development Stage and Business Risk

Hurdle Rate	Start-of-Exploration	Start-of-Feasibility	Decision-to-Build
COPPER PROJECTS			
10%	40 to 50%	50 to 55%	52 to 57%
15%	35 to 50%	45 to 50%	47 to 52%
20%	25 to 35%	40 to 45%	42 to 47%
25%	25 to 35%	38 to 43%	39 to 44%
GOLD PROJECTS			
10%	45 to 50%	65 to 70%	67 to 72%
15%	35 to 40%	57 to 62%	60 to 65%
20%	25 to 35%	50 to 55%	50 to 60%
25%	20 to 30%	48 to 53%	47 to 57%

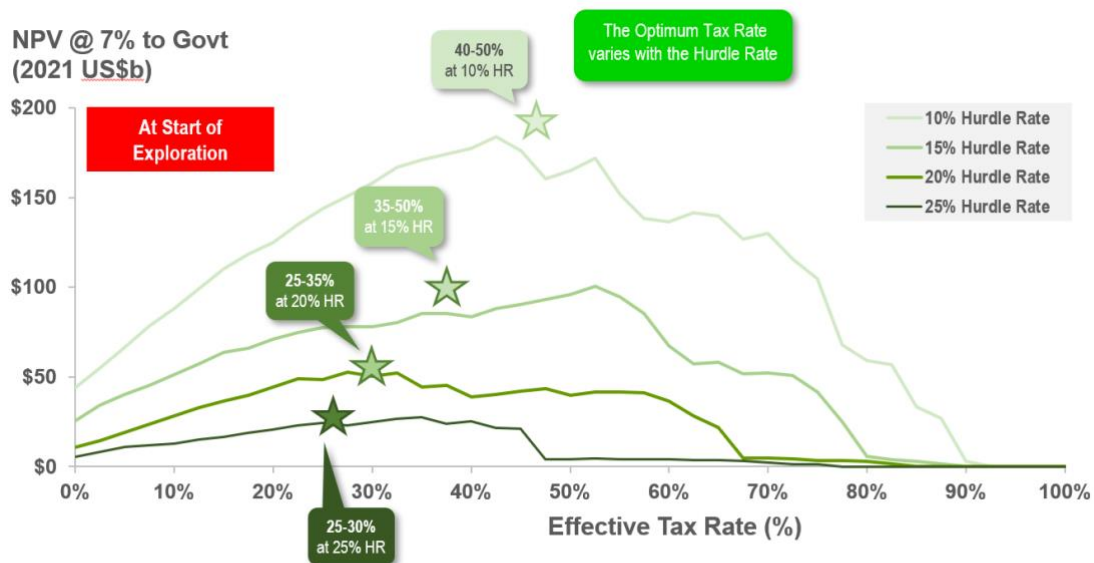
Source: MinEx Consulting © April 2022



Note: Effective Tax rate includes Corporate Tax + DWT + Royalties + Tax Holidays etc
Based on modelling the economics of 292 copper deposits found in the World between 1995-2019
The Company's Decision-to-Build is based on \$3.00/lb Cu price and a 20% hurdle-rate
Feasibility Study cost is 7% of initial Capex spread over 3 years
Exploration cost is 2.1c/lb Cu-eq spread over 5 years

Source: MinEx Consulting © April 2022

Figure 15. NPV to the Government for Copper Projects – by Stage of Development and 20% Hurdle Rate



Note: Effective Tax rate includes Corporate Tax + Royalties + Tax Holidays etc
Based on modelling the economics of 292 copper deposits found in the World between 1995-2019
The Company's Decision-to-Build is based on \$3.00/lb Cu price
Feasibility Study cost is 7% of initial Capex spread over 3 years
Exploration cost is 2.1c/lb Cu-eq spread over 5 years

Source: MinEx Consulting © April 2022

Figure 16. Effect of Business Risk on the Optimum Tax Rate to the Government for Copper Projects – at Start-of-Exploration

Key Factors Influencing the Optimum Effective Tax Rate

For any given country the Optimum Effective Tax Rate (OETR) depends on:

- **Mining Costs;** Countries with high costs / poor infrastructure need a lower OETR to offset lower profitability on its projects
- **Business Risk:** Countries with low-risk can set the OETR at a higher rate
- **Mineral Endowment;** Countries with low quality deposits need a lower OETR
- **Resource Maturity:** if the Government's view is that the potential for new discoveries is exhausted, the Country should focus on maximizing the returns from its existing operations. This means a higher OETR. Conversely, if there are good opportunities to make additional discoveries the Government needs to set the OETR at a low rate so as to encourage additional exploration

With regard to the last point, the four strategic options available to the Government are:

1. **Grow the business** (i.e. "*Grow the Herd of Cows*") – by supporting exploration. This strategy works best for countries with a young but positive exploration history
2. **Sustain the business** (i.e. "*Maintain the Current Herd of Cows*") – by encouraging the feasibility studies to be completed on the inventory of known deposits, with the aim of maintaining a steady level of production over the short to medium term. This strategy works best for countries where the discovery performance is starting to mature
3. **Maximize the existing opportunities** (ie "*Milk the Existing Cows*") – by encouraging those projects that are at the Decision-to-Build stage to go into production. This also involves encouraging companies to reinvest in their existing mines – thereby extending their useful life. This strategy works best for countries which have a large inventory of known undeveloped deposits and the exploration scene is mature – meaning that opportunities for finding large new deposits are limited
4. **Harvest the existing operations** (i.e. "*Kill the Cow*") – by increasing the tax rate to extract the maximum return from existing operating mines. This strategy works best where the exploration potential for new discoveries has been exhausted and the mining sector is in terminal decline

The last option generates the largest income in the short term, but has the risk of destroying future earnings if it is found that the assessment of the exploration potential was wrong.

Optimum Effective Tax Rate for Mongolia

With regard to Mongolia, the country has higher than average capital costs – mainly due to poor infrastructure in outlying areas. A benchmarking study of mining costs carried out by MinEx in 2019 ranked it 13th out of 20 countries surveyed. Mongolia rated better in terms of operating costs, and was ranked at 9th out of 20 (see Appendix H for details). On that basis, its mining cost position will only have a modest negative impact on the calculated optimum ETR.

In terms of Business Risk, the 2017 Fraser Institute Survey of Mining Companies (Fraser Institute, 2018) ranked Mongolia at 70th out of 91 jurisdictions surveyed in terms of its Policy Perception Index. This put it in the bottom quartile of the countries surveyed - making it high-risk destination for investors.

Even though the Fraser Institute Survey's ranking of Mongolia is now four years old, Export Finance Australia (an agency of the Australian Government) and the OECD currently set the Overall Risk Rating for Mongolia at 6 out of 7; stating that there is "elevated risk of Mongolia being unable and/or unwilling to meet its external debt obligations. But economic recovery and improved public and external finances, owing in large part to progress on IMF-led reforms, are positives for the rating" Export Finance Australia (2021).

Given the above, MinEx's judgement is that foreign mining companies should apply a Hurdle rate of 20% for new investments in Mongolia. This has a material adverse impact on the optimum ETR.

In terms of mineral endowment, the 2017 Fraser Institute Survey ranked Mongolia's Mineral Potential at 31st out of 91 (Fraser Institute, 2018).

MinEx's own analysis confirms that for copper – with both the average size and grade of deposit found in the last 25 years in Mongolia being higher than the global average⁸. However, the endowment story for gold is less compelling – with average size of gold deposit discovered smaller but higher grade than the global average⁹.

On balance, Mongolia's mineral endowment is good and, which favors the use of a (slightly) higher Optimum ETR.

MinEx considers Mongolia to be highly prospective for additional mineral discoveries. On this basis, Mongolia's development strategy should be to "Grow the Business". This means that the OETR should be set low, so as stimulate the exploration to find and develop the next generation of mines.

Given all of the above, on balance Mongolia's Optimum ETR should be based on a Hurdle Rate of 20% with a strategic focus setting the tax rate at a level that grows the exploration and mining sector.

⁸ The weighted average size of copper deposit found in Mongolia was 848 Mt @0.82% Cu-eq, versus the World average of 524 Mt @ 0.67% Cu-eq. See Appendix F for more details.

⁹ The weighted average size of gold deposit found in Mongolia was 13 Mt @ 1.87 g/t Au-eq, versus the World average of 66 Mt @ 1.14 g/t Au-eq. See Appendix F for more details.

Methodology Used to calculate the Country's Effective Tax Rate

The following methodology used to calculate a given Country's ETR:

- An economic model was set up to model the cashflows and financials for copper and gold deposits
- The model uses the actual tax and investment rules for each country (see Appendix A for details)
- The model was run using the known tonnes & grade and mining method for 292 individual copper and 856 gold projects discovered in the World since 1995
- The NPVs at the various stages of development (i.e. at the Start-of-Exploration, Start-of Feasibility and Decision-to-Build) were calculated using a 7% real after-tax discount rate. The resulting NPV's were summed-up for those projects that exceeded the Hurdle Rate (of 10%, 15%, 20% or 25%)
- The economic model was then run using a "vanilla" set of tax and investment rules – where the only tax impost was the Corporate Tax. This excluded items such as Royalties, VAT payment, Import Duties and Dividend Withholding Taxes and Tax Holidays etc.
- Using the "vanilla" set of tax rules the Corporate Tax Rate was then adjusted up-or-down to give the same NPV as that previously calculated for each Country (using that Country's specific set of tax and investment rules). The resulting Corporate Tax required corresponds to the **Country ETR**.

Current ETR for Mongolia

Figures 17 and 18 plot the value-curves for copper and gold at the various stages of development using a 20% Hurdle Rate. Overlaid on this is the Effective Tax Rate for Mongolia for each of these stages. The ETR was calculated using Mongolia's current tax & investment rules and Royalty rates.

In the case of copper, Mongolia's current ETR varies from 60% to 73% depending on the development stage chosen. Similarly, Mongolia's ETR for gold varies from 47% (at the Start-of-Exploration Stage) to 78% (at the Decision-to-Build Stage)¹⁰.

It is significant to note, that the current ETR for Mongolia lies well above the Optimum ETR for all Stages of Development. The high rates are a strong disincentive to companies to find and develop new projects in Mongolia. As a result, the Government is missing out on revenues from potential future new mines.

¹⁰ It should be noted that the calculated Country ETR for Mongolia vary slightly from that previously reported in Tables 2 and 3. This is due to the fact that the model used to calculate the ETRs in Tables 2 and 3 were based on only two (hypothetical) open pit and underground mines for each commodity. In contrast, the Current ETR for Mongolia was modelled using several hundred (real-life) copper and gold projects. These projects will have different economics & profitability, resulting in a slightly different ETR.

Key Drivers behind Mongolia's high ETR

As discussed earlier, Mongolia's Corporate Tax Rate 25% compares favourably against its peers – placing it third out of the 16 countries surveyed¹¹ and well below the global average rate of 29%. However, after taking into account the total package of tax & investment rules, Mongolia's Effective Tax Rate rises to ~60% (at the Start-of-Exploration for copper projects) which is well above that of its peers (which have a combined average ETR of ~47%).

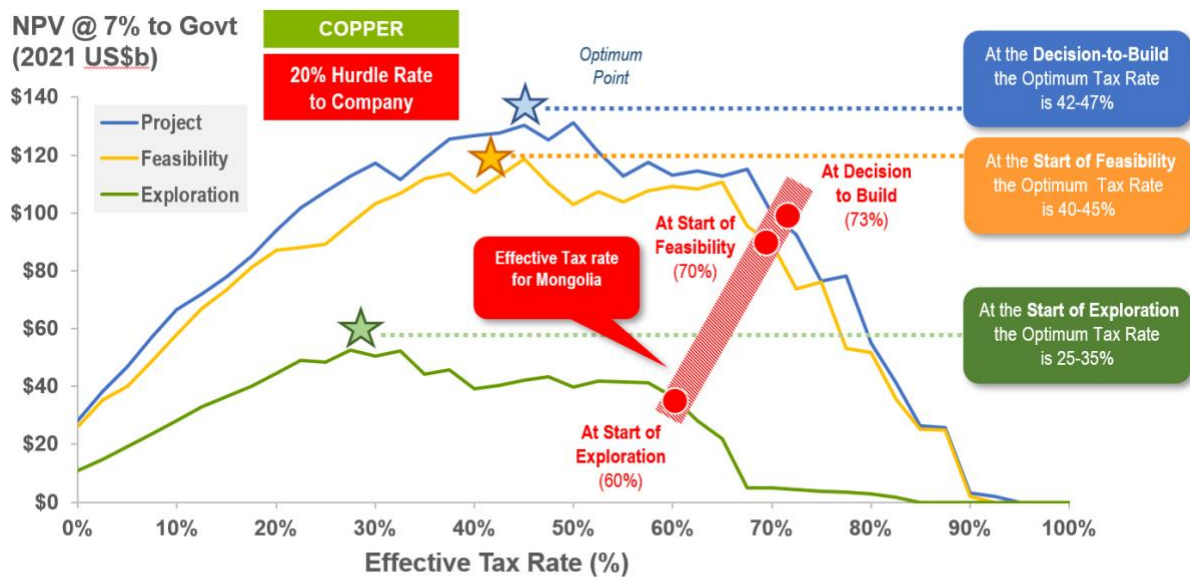
The increase in Mongolia's ETR is driven by several factors. Table 5 details the effect of incrementally changing Mongolia's current investment rules to match the Default Investment Rules for a 30% ETR. As can be seen, by far the single largest factor is the current large Royalty payable on copper – which (at a copper price of \$3.00/lb) equates to an effective tax of ~16%. The second largest contributor, at ~6% Effective Tax Rate, is the current ruling preventing companies from recovering VAT payments on the initial capital expenditure. As indicated in Appendix A, most countries allow prompt refunds; the only exceptions are the United States, Mexico and Brazil.

Table 5. Impact of changes in the Tax Rules on the Effective Tax Rate (ETR) for Mongolia: Copper Projects at the Start-of-Exploration Stage

Case #	Details	Estimated Country ETR at 20% Hurdle Rate			
		Based on NPV	Based on No of Viable Projects	Average	Change
A	BASE CASE (Current Investment Rules)	59.5%	55.3%	57.4%	-
B	A + No Royalties on Copper	~45%	41.6%	41.3%	-16.1%
C	B + Full & Immediate Refund of VAT Payments (previously was no VAT Recovery on Capex)	~36%	35.0%	35.5%	-5.8%
D	C + Immediate writeoff of Feasibility Study costs (on mine startup)	~33.5%	32.5%	33.0%	-2.5%
E	D + Faster Depreciation Rates for Mine & Plant (10% vs 5% SL), Equipment (20% vs 10% SL, Infrastructure (no change - Life of Mine)	~32%	32.0%	32.0%	-1.0%
F	E + No Import Duty on Capex (was 5%)	29.5%	31.1%	30.3%	-1.7%
G	F + No Dividend Withholding Tax (was 10%)	-26.0%	25.8%	25.9%	-4.4%
H	G + Lower Inflation Rate (2% vs 7%)	25.0%	25.8%	25.4%	-0.5%
I	H + 30% Corporate Tax Rate (was 25%)	30.0%	30.0%	30.0%	4.6%
J	DEFAULT ("Vanilla") Investment Rules	30.0%	30.0%	28.0%	-

Source: MinEx Consulting © April 2022

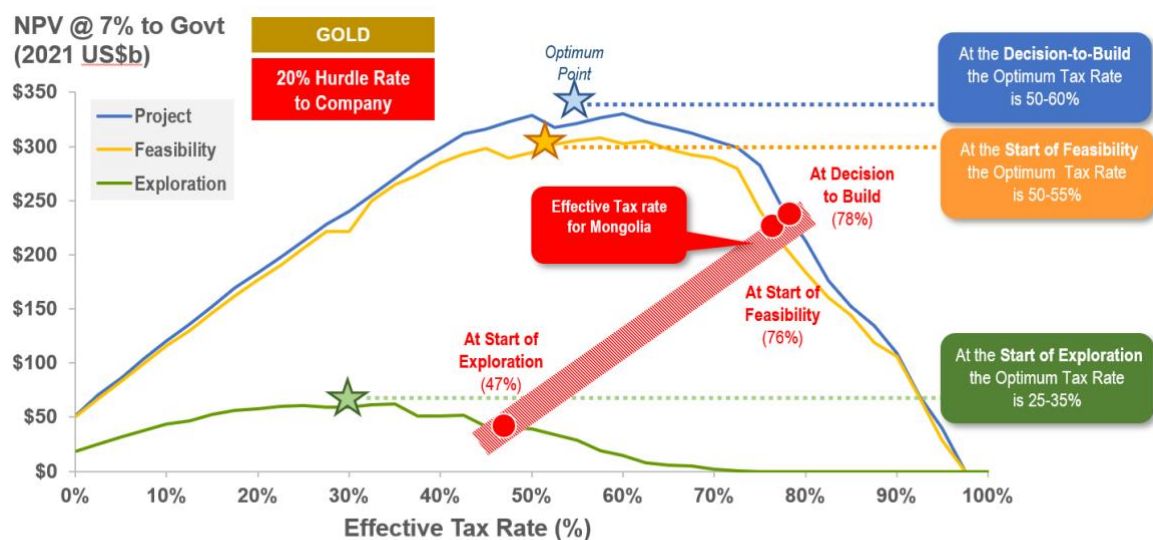
¹¹ Mongolia's Corporate Tax Rate of 25% is only beaten by Serbia and Kazakhstan (each at 20%). The average tax rate for the 16 peer countries is 29%.



Note: Effective Tax rate includes Corporate Tax + DWT + Royalties + Tax Holidays etc
Based on modelling the economics of 292 copper deposits found in the World between 1995-2019
The Company's Decision-to-Build is based on \$3.00/lb Cu price and a 20% hurdle-rate
Feasibility Study cost is 7% of initial Capex spread over 3 years
Exploration cost is 2.1c/lb Cu-eq spread over 5 years

Source: MinEx Consulting © April 2022

Figure 17. Effective Tax Rate for Mongolia versus Optimum NPV to Government for Copper Projects at the Start-of-Exploration



Note: Effective Tax rate includes Corporate Tax + DWT + Royalties + Tax Holidays etc
Based on modelling the economics of 848 gold deposits found in the World between 1995-2019
The Company's Decision-to-Build is based on \$1500/oz Au price and a 20% hurdle-rate
Feasibility Study cost is 7% of initial Capex spread over 3 years
Exploration cost is \$50/oz Au-eq spread over 5 years

Source: MinEx Consulting © April 2022

Figure 18. Effective Tax Rate for Mongolia versus Optimum NPV to Government for Gold Projects at the Start-of-Exploration

Effective Tax Rate for Mongolia versus its Peer Countries

To help benchmark Mongolia's Effective Tax Rates, the Country ETR for copper and gold projects in 16 other countries and jurisdictions were modelled.

The key results are summarized in Tables 6 and 7. The countries were ranked as being of Low, Medium or High Risk.

Mongolia's ETR at the Start-of-Exploration of 60% for copper and 47% for gold is at the high-end of what paid in other Countries.

As discussed before, the optimum tax rate varies inversely with the level of Country Risk. Consequently, given that Mongolia is considered to be a high-risk destination for investors, its current ETR significantly less competitive than low-risk countries such as the USA (23% for copper projects in New Mexico and 27% for gold projects in Nevada), Canada (39% for both copper and gold in Ontario) and Western Australia (31% and 35% for copper and gold respectively).

Apart from a few outliers, such as the USA and Serbia (at the low-end) and Ghana at the high-end, most countries are clustered around the optimum tax rate for their level of Country Risk.

Table 6. Effective Tax Rates of Selected Countries for Copper Projects at the Start-of-Exploration

Country	Country Risk Rating	Corporate Income Tax Rate [%]	Effective Tax Rate at Start-of-Exploration (Based on NPV to Government)							
			Simple Analysis (of 2 deposits)		Detailed Analysis (Based on 292 Open Pit & UG deposits)					
					Company Hurdle Rate					
			Open Pit	U/Ground	10%	15%	20%	25%		
COPPER PROJECTS										
Mongolia	High	25%	53.1%	56.7%	58%	56%	60%	63%		
Western Australia	Low	30%	37.0%	37.9%	31%	33%	39%	41%		
Ontario	Low	26.5%	26.2%	22.5%	39%	~40%	~30%	~40%		
Nevada	Low	NA	NA	NA	NA	NA	NA	NA		
New Mexico	Low	26.9%	28.1%	28.2%	23%	17%	19%	20%		
Chile (current)	Low	27%	39.1%	37.6%	39%	40%	41%	48%		
Chile (proposed)	Low ?	27%	67.5%	68.1%	66%	67%	62%	65%		
Peru	Medium	44.5%	57.3%	55.7%	67%	57%	60%	59%		
Mexico	Medium	30%	48.2%	48.2%	55%	56%	59%	64%		
Brazil	Medium	34%	45.7%	47.6%	58%	58%	61%	65%		
Ghana	Medium	35%	51.7%	49.8%	56%	56%	60%	64%		
South Africa	Medium	28%	40.6%	35.6%	47%	44%	51%	43%		
Serbia	Medium	15%	21.7%	19.9%	21%	22%	21%	20%		
China	Medium	25%	40.4%	39.0%	34%	33%	~40%	44%		
Kazakhstan	High	20%	37.2%	34.4%	~40%	38%	44%	43%		
DR Congo	High	30%	46.9%	43.4%	~60%	58%	61%	65%		
Papua New Guinea	High	30%	39.5%	35.3%	41%	~40%	~42%	~37%		
Zambia	High	30%	51.7%	52.4%	58%	56%	60%	62%		
Average for 16 peer countries excluding Mongolia	NA	28.7%	42.4%	41.0%	46%	45%	47%	49%		

Source: MinEx Consulting © April 2022

Table 7. Effective Tax Rates of Selected Countries for Gold Projects at the Start-of-Exploration

Country	Country Risk Rating	Corporate Income Tax Rate [%]	Effective Tax Rate at Start-of-Exploration (Based on NPV to Government)							
			Simple Analysis (of 2 deposits)		Detailed Analysis (Based on 856 Open Pit & UG deposits)					
					Company Hurdle Rate					
			Open Pit	U/Ground	10%	15%	20%	25%		
GOLD PROJECTS										
Mongolia	High	25%	50.7%	42.4%	58%	51%	47%	43%		
Western Australia	Low	30%	36.6%	34.1%	~35%	~35%	35%	34%		
Ontario	Low	26.5%	19.5%	22.4%	39%	~35%	~35%	~35%		
Nevada	Low	21%	44.8%	36.3%	27%	19%	15%	36%		
New Mexico	Low	NA	NA	NA	NA	NA	NA	NA		
Chile (current)	Low	27%	38.7%	35.8%	35%	57%	54%	48%		
Chile (proposed)	Low ?	27%	NA	NA	NA	NA	NA	NA		
Peru	Medium	44.5%	56.3%	56.3%	58%	59%	58%	~61%		
Mexico	Medium	30%	47.2%	41.4%	57%	51%	51%	50%		
Brazil	Medium	34%	51.8%	44.2%	59%	54%	53%	50%		
Ghana	Medium	35%	58.7%	51.5%	61%	60%	57%	57%		
South Africa	Medium	28%	41.9%	40.0%	48%	~48%	50%	48%		
Serbia	Medium	15%	22.2%	17.0%	18%	18%	18%	16%		
China	Medium	25%	43.8%	37.3%	36%	~40%	44%	44%		
Kazakhstan	High	20%	42.2%	35.7%	37%	~40%	43%	43%		
DR Congo	High	30%	50.7%	44.2%	61%	58%	55%	57%		
Papua New Guinea	High	30%	39.5%	37.0%	44%	~41%	38%	41%		
Zambia	High	30%	62.7%	51.7%	59%	55%	54%	51%		
Average for 16 peer countries excluding Mongolia	NA	28.3%	43.8%	39.0%	45%	45%	44%	45%		

Source: MinEx Consulting © April 2022

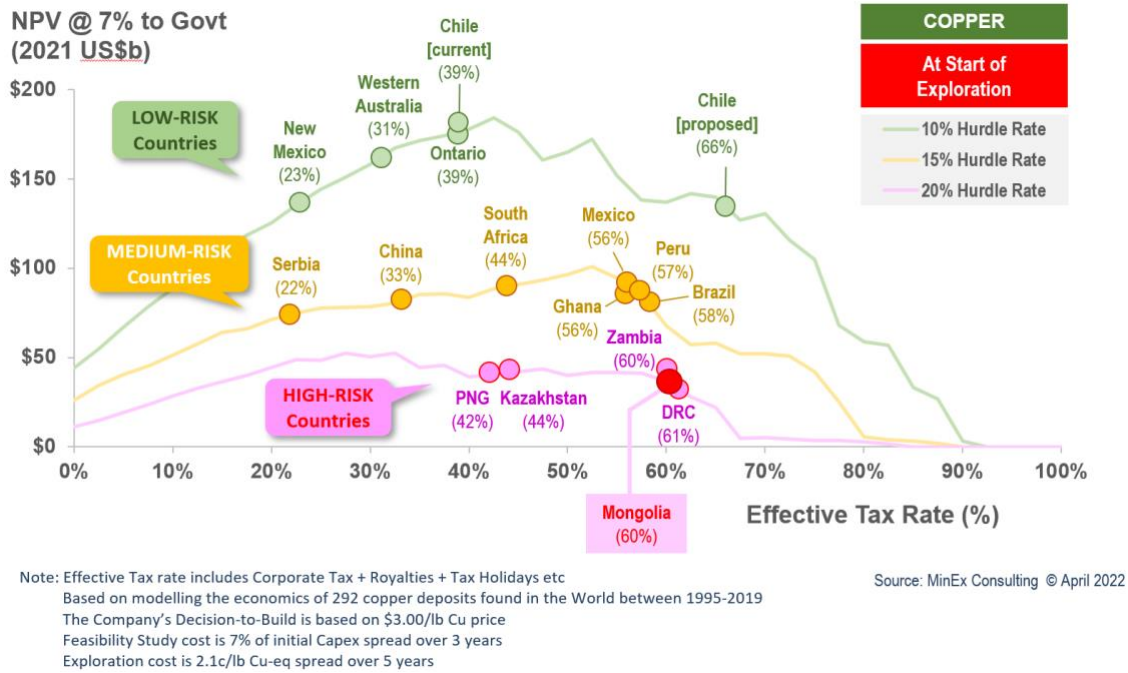


Figure 19. Effective Tax Rates of Selected Countries versus NPV to Government for Copper Projects at the Start-of-Exploration

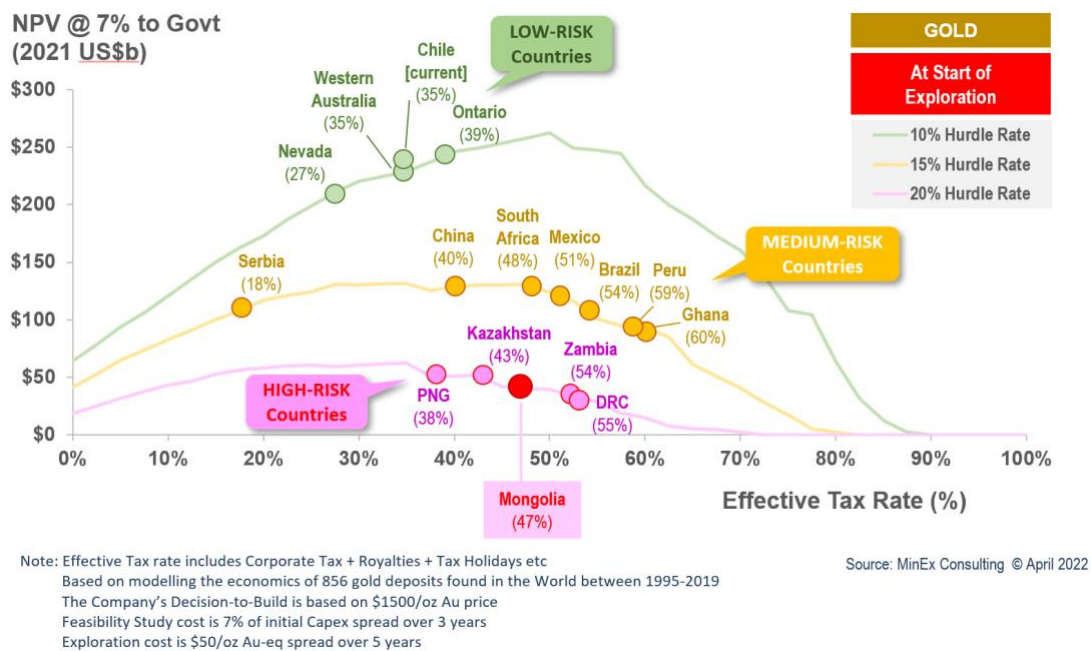


Figure 20. Effective Tax Rates of Selected Countries versus NPV to Government for Gold Projects at the Start-of-Exploration

How to Maximise the Value of the Mongolian Mining Industry

A key learning from this analysis is that there is no “*one-size fits all*” tax rate for the World’s mining industry that maximises the return to the local host Government. The optimum rate depends on the mineral endowment and the level of business risk in a given country.

While there is value for the Mongolian Government in fine-tuning its current tax regime¹², the greatest payout comes from finding ways of lowering the level of business risk in the country. Moving from a high- to low-level of business risk (from a Hurdle Rate of 20% to 10%) will more than double the size of the industry and triple the captured value in the longer term.

Figure 21 shows a schematic roadmap of what the Government should do to maximise its return from the mining industry.

The first step is to adjust the current tax rate to line-up with the Optimum ETR (estimated to be in the range of 25 to 35%, based on a Hurdle Rate of 20%).

The second step is to lower the cost of discovery (as this will improve project economics). This can be achieved through tax incentives - such as:

- Providing investors with a tax-break (such as the Flow-Through Financing scheme currently operating in Canada)
- Providing co-funded drilling programs (as is the case in Australia)
- Investing in pre-competitive data sets for industry to use (thereby saving the companies from repeating previous surveys, as well as helping companies better identify exploration targets)
- Mandating that when a company relinquishes an exploration tenement all exploration data (such as geochemical and geophysical surveys, drill results etc.) be captured by the Government and placed into the public domain – for the benefit of future explorers
- Streamlining the approvals process (thereby shortening the lead-time to discovery)

The third (and most important) step is to lower the level of perceived business risk for the country. This will take time and require a large commitment from Government to engage with companies and provide sound policies that build trust and help grow the industry.

The final step involves re-optimising the ETR to reflect the prevailing lower level of business risk.

¹² It is significant to note that the value-curves are relatively “flat” around their optimum points. In other words, a change of +/- 10 percentage points in the tax rate has only a modest impact on the total revenues raised. Even so, the number of mining projects developed is sensitive to the rate used. For example (as shown Figure 12) increasing the ETR from (say) 30% to 40% will lower the percentage of copper projects that are economically viable from 21% to 18%. The corresponding figure for gold is a reduction from 47% to 44%. In both cases the numbers are based on a 20% Hurdle Rate.

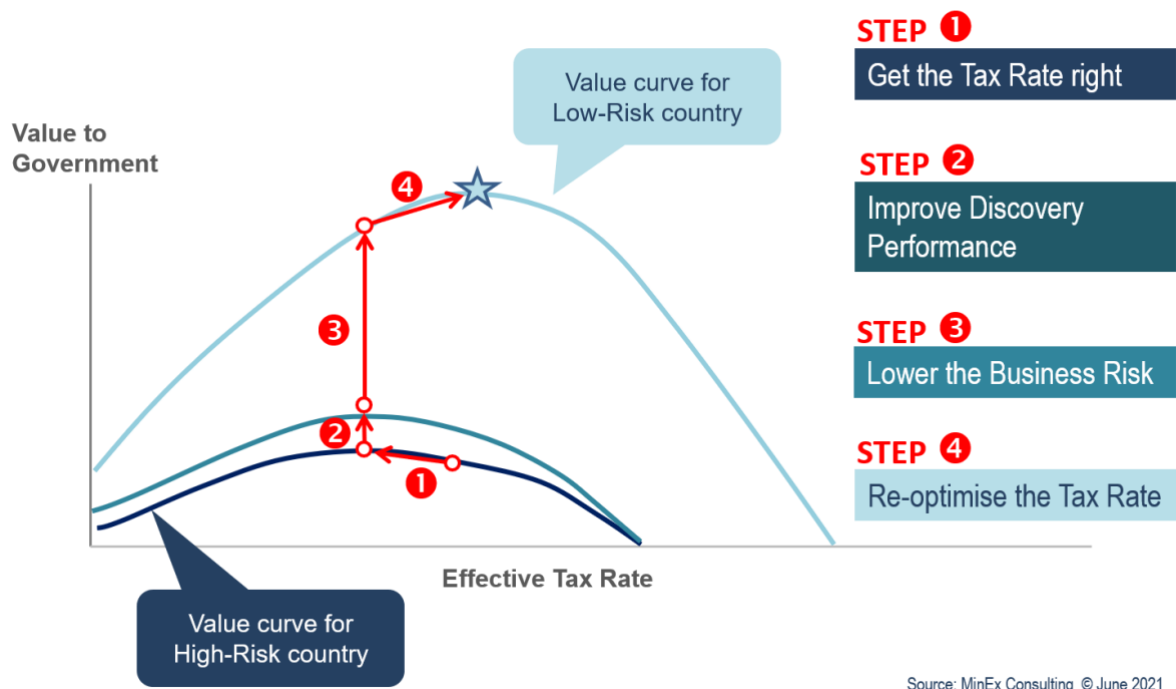


Figure 21. Steps required by Government to Maximise the Value of Mining

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Appendix A: Tax Rates for 16 Countries & Jurisdictions

	DEFAULT CASE (af)	Mongolia	Western Australia	Ontario	New Mexico (Copper)	Nevada (Gold)	Chile (Current)	Chile (Proposed)
Country Risk	LOW	HIGH	LOW	LOW	LOW	LOW	LOW	LOW ?
Corporate Tax Rate	30%	25%	30%	26.5% [15% Federal Tax + 11.5% Provincial Tax]	26.9% [21% Federal Tax + 5.9% State Tax]	21% [21% Federal Tax + zero State Tax]	27%	27%
Tax Holiday	No	No	No	POSSIBLE (m)	No	No	No	No
VAT Rate	0%	10%	10%	5%	5.125% (y)	7.1% (y)	19%	19%
Is VAT immediately refundable?								
... on Explorn & Feas?	Yes	NO	Yes	Yes	NO	NO	NO	NO
... on Initial Capex?	Yes	NO	Yes	Yes	NO	NO	Yes	Yes
... on Sustaining Capex?	Yes	NO	Yes	Yes	NO	NO	Yes	Yes
... on Closure Capex?	Yes	NO	Yes	Yes	NO	NO	NO	NO
... on Opex?	Yes	Yes	Yes	Yes	NO	NO	Yes	Yes
Import Duty (ID) on Capex	0%	5%	5%	0%	0% (aa)	0% (aa)	0% (ab)	0% (ab)
Initial Capex exempt of ID ?	NA	NO	NO	NA	NA	NA	Yes	Yes
Sustaining Capex exempt of ID ?	NA	NO	NO	NA	NA	NA	Yes	Yes
ID payable on Consumables (in addition to VAT paid)	0%	5%	5%	0% (aa)	0% (aa)	0% (aa)	6%	6%
Dividend Withholding Tax (a)	0%	10%	0% (t)	5% (u)	5% (f)	5% (f)	8% (c)	8% (c)
Government Equity in Project	NA	NA	NA	NA	NA	NA	NA	NA
Royalties Cu	Zero	0 to 15% Gross Revenue, depending on the Cu price (w)	5% Net Revenue	10% Net Profit	1.1% Net Revenue (p)	NA	0 to 14% Operating Profit, depending on the Cu & Au price and mine size (k)	0% to 3% Net Revenue plus 0% to 75% Royalty on Operating Profits. Rates vary with mine size and Cu price (l)
Au	Zero	0 to 5% Gross Revenue, depending on the Au price (x)	2.5% Gross Revenue	10% Net Profit	NA	2 to 5% of Operating Profit depending on the ratio of Net Proceeds to Gross Proceeds (q)	0 to 14% Operating Profit, depending on the Cu & Au price and mine size (k)	NA - Not yet reported
Are Royalties Tax-Deductible ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flow-Thru Tax Credits for Exploration? (s)	No	No	No	YES	No	No	No	No
Depreciation or Depletion ?	Depreciation	Depreciation	Depreciation	Depreciation	DEPLETION (r)	DEPLETION (r)	Depreciation	Depreciation
Depreciation Schedule								
Feas Study	100% write-off on startup	Life-of-Mine on startup	100% write-off on startup	100% write-off on startup	NA	NA	100% write-off on startup	100% write-off on startup
Equipment	20% pa Straight-Line	10% pa Straight-Line	20% pa Straight-Line	25% pa Reducing Balance	NA	NA	14.3% pa Straight-Line	14.3% pa Straight-Line
Mine & Plant	5% pa Straight-Line	2.5% pa Straight-Line	5% pa Straight-Line	25% pa Reducing Balance	NA	NA	6.7% pa Straight-Line	6.7% pa Straight-Line
Infrastructure	Life-of-Mine	Life-of-Mine	Life-of-Mine	25% pa Reducing Balance	NA	NA	Life-of-Mine	Life-of-Mine
Depletion allowance	NA	NA	NA	NA	15%	15%	NA	NA
Tax Losses Carry-Forward ?	Yes - Indefinite	Yes - 5 Years	Yes - Indefinite	Yes - 20 Years	Yes - Indefinite	Yes - Indefinite	Yes - Indefinite	Yes - Indefinite
Inflation Rate (v)	2%	5%	2%	2%	2%	2%	3%	3%

Source: MinEx Consulting April 2022, based on reports from Deloitte, PFK, PwC, Fitch and relevant Government Agencies

	Peru	Mexico	Brazil	Ghana	South Africa	Serbia	China
Country Risk	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM
Corporate Tax Rate	44.5% [29.5% Income Tax + ~14% Other Taxes] (g)	30%	34% [15% Income Tax + 10% Surtax + 9% Social Contribution Tax]	35%	28%	15%	25%
Tax Holiday	No	No	No	No	No	YES - 10 Years	No
VAT Rate	18%	16%	18% (z)	13.5%	15%	20%	13%
Is VAT immediately refundable?							
... on Explor & Feas?	Yes	NO	NO	NO	Yes	Yes	Yes
... on Initial Capex?	Yes	NO	NO	Yes	Yes	Yes	Yes
... on Sustaining Capex?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
... on Closure Capex?	Yes	NO	NO	NO	Yes	NO	NO
... on Opex?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Import Duty (ID) on Capex	~2.2%	0%	9.25% (ac)	0%	5%	5.4%	0% (aa)
Initial Capex exempt of ID ?	NO	NA	NO	NA	NO	YES	NA
Sustaining Capex exempt of ID ?	NO	NA	NO	NA	NO	YES	NA
ID payable on Consumables (in addition to VAT paid)	~2.2%	0%	9.25% (ac)	5%	5%	5.4%	0% (aa)
Dividend Withholding Tax (a)	5%	~10% (d)	0%	8%	~15% (b)	10% (e)	10%
Government Equity in Project	NA	NA	NA	10% Free-Carry	NA	NA	NA
Royalties Cu	1 to 12% Net Profit Before Tax, depending on the Profit Margin (n)	0.5% Net Revenue	5% Net Revenue	5% Net Revenue	0% to 9% Net Revenue, depending on the ratio of EBIT to Net Revenue (i)	5% Net Revenue	~6% Gross Revenue (h)
Royalties Au	1 to 12% Net Profit Before Tax, depending on the Profit Margin (n)	0.5% Net Revenue	2% Gross Revenue	5% Net Revenue	0% to 12.5% Net Revenue, depending on the ratio of EBIT to Net Revenue (j)	5% Net Revenue	~4% Gross Revenue (h)
Are Royalties Tax-Deductible ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flow-Thru Tax Credits for Exploration? (s)	No	No	No	No	No	No	No
Depreciation or Depletion ?	Depreciation	Depreciation	Depreciation	Depreciation	Depreciation	Depreciation	Depreciation
Depreciation Schedule							
Feas Study	10% pa Straight-Line on startup	10% pa Straight-Line on startup	20% pa Straight-Line on startup	80% pa Reducing Balance on startup	100% write-off on startup	15% pa Reducing Balance on startup	100% write-off on startup
Equipment	20% pa Straight-Line	12% pa Straight-Line	30% pa Straight-Line	30% pa Reducing Balance	20% pa Straight-Line	30% pa Reducing Balance	20% pa Straight-Line
Mine & Plant	20% pa Straight-Line	5% pa Straight-Line	10% pa Straight-Line	10% pa Straight-Line	20% pa Straight-Line	15% pa Reducing Balance	15% pa Straight-Line
Infrastructure	3% pa Straight-Line	Life-of-Mine	Life-of-Mine	Life-of-Mine	Life-of-Mine	15% pa Reducing Balance	Life-of-Mine
Depletion allowance	NA	NA	NA	NA	NA	NA	NA
Tax Losses Carry-Forward ?	Yes - 4 Years	Yes - 10 Years	Yes - Indefinite	Yes - 3 Years	Yes - Indefinite	Yes - 5 Years	Yes - 5 Years
Inflation Rate (v)	3%	4%	4%	9%	4%	2%	2%

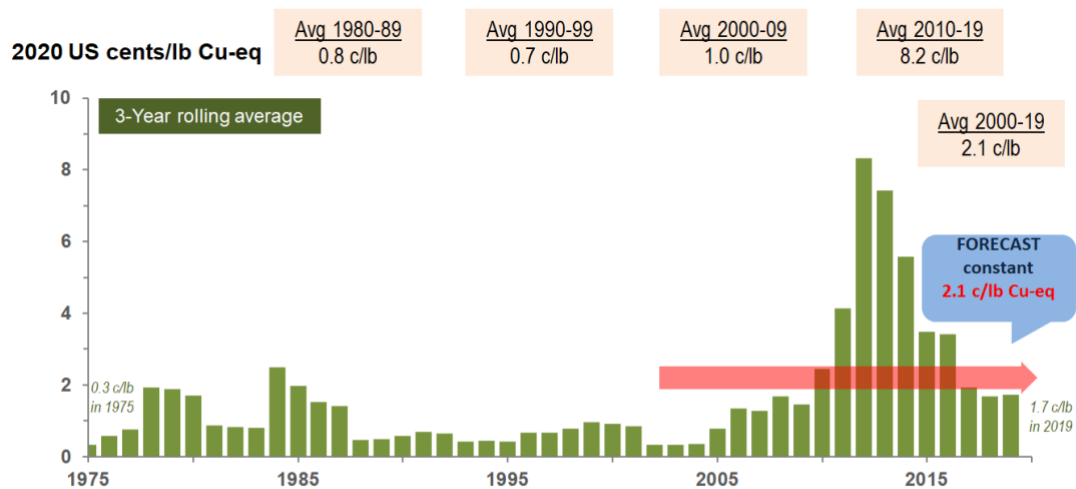
Source: MinEx Consulting April 2022, based on reports from Deloitte, PFK, PwC, Fitch and relevant Government Agencies

	Kazakhstan	DRC	PNG	Zambia
Country Risk	HIGH	HIGH	HIGH	HIGH
Corporate Tax Rate	20%	30%	30% An additional 30% may apply on super- profits (o)	30%
Tax Holiday	No	No	No	No
VAT Rate	12%	16%	10%	16%
Is VAT immediately refundable?				
... on Explor & Feas?	NO	NO	Yes	NO
... on Initial Capex?	Yes	Yes	Yes	NO
... on Sustaining Capex?	Yes	Yes	Yes	Yes
... on Closure Capex?	NO	NO	Yes	NO
... on Opex?	Yes	Yes	Yes	Yes
Import Duty (ID) on Capex	6.9%	6.1% (ad)	0% (ae)	0%
Initial Capex exempt of ID ?	Yes	NO	NA	NA
Sustaining Capex exempt of ID ?	Yes	NO	NA	NA
ID payable on Consumables (in addition to VAT paid)	6.9%	6.1% (ad)	0% (ae)	0%
Dividend Withholding Tax (a)	15%	10%	~15%	10%
Government Equity in Project	NA	10% Free-Carry	NA	NA
Royalties Cu	5.7% Net Revenue	5% Net Revenue	2% Gross Revenue (o)	5.5% Gross Revenue
AU	5% Net Revenue	3% Net Revenue	2% Gross Revenue (o)	5.5% Gross Revenue
Are Royalties Tax-Deductible ?	Yes	Yes	Yes	NO
Flow-Thru Tax Credits for Exploration? (s)	No	No	No	No
Depreciation or Depletion ?	Depreciation	Depreciation	Depreciation	Depreciation
Depreciation Schedule				
Feas Study	10% pa Straight-Line on startup	40% pa Reducing Balance on startup	10% pa Straight-Line on startup	100% write-off on startup
Equipment	25% pa Straight-Line	40% pa Reducing Balance	25% pa Straight-Line	10% pa Straight-Line
Mine & Plant	10% pa Straight-Line	40% pa Reducing Balance	10% pa Straight-Line	5% pa Straight-Line
Infrastructure	10% pa Straight-Line	40% pa Reducing Balance	10% pa Straight-Line	Life-of-Mine
Depletion allowance	NA	NA	NA	NA
Tax Losses Carry-Forward ?	Yes - 10 Years	Yes - Indefinite	Yes - 7 Years	Yes - 10 Years
Inflation Rate (v)	6%	3%	4%	12%

Source: MinEx Consulting April 2022, based on reports from Deloitte, PFK, PwC, Fitch and relevant Government Agencies

- Notes:
- (a) The Dividend Withholding Tax (DWT) is payable on profits repatriated (ie no DWT on repayment of initial capex). Have assumed that the foreign company has structured its business to take advantage of existing Tax Treaties - such that the actual DWT paid is less than the normal full reported rate.
 - (b) In South Africa to the full rate for DWT is 20%, reducing to 5-15% for Treaty Countries
 - (c) In Chile the actual DWT rate is 35%, but get full credit on any Corporate Tax paid (of 25%) - leaving a net DWT of 8%
 - (d) In Mexico the full rate for DWT is 20%, reducing to 5-15% for Treaty Countries
 - (e) In Serbia the full rate for DWT is 20%, reducing to 10% for Treaty Countries
 - (f) In the US, the full rate for DWT is 30%, reduces to 5% for companies based in the UK. DWT for Australian companies is 15%
 - (g) In Peru companies pay 29.5% Corporate Tax plus a special Tax on Mining of 2 to 8.4% of Operating Income, plus and a Special Obligation on Mining of 4 to 13.4% of operating income. Have ignored Energy and Mining Investment Regulatory Agency (OSINERGMIN) contribution of 0.14% of operating costs and Agency for Environmental Assessment and Enforcement (OEFA) contribution of 0.1% of operating costs
 - (h) In China the Royalty Rate for copper varies between 2-10% of Gross Revenue, and 2-6% for gold
 - (i) In South Africa a 0% to 9% NSR Royalty is payable on copper, with the rate depending on the ratio of Earnings Before interest & Tax (EBIT) and Gross Revenues. In the case of low margin projects, a minimum NSR Royalty of 0.5% is payable on sales revenues
 - (j) In South Africa a 0% to 12.5% NSR Royalty is payable on gold, with the rate depending on the ratio of Earnings Before interest & Tax (EBIT) and Gross Revenues. In the case of low margin projects, a minimum NSR Royalty of 0.5% is payable on sales revenues
 - (k) In Chile, the current situation is that for mines producing <50ktpa Cu-eq, the current Royalty rate (on Operating Profit basis) varies between 0 and 4.5% depending the level of production. Above 50 ktpa Cu-eq production, the rate varies between 5% and 14% depending on the Operating Profit Margin
 - (l) In Chile the proposed new Royalty on copper is in two parts - the first being an Ad Valorem Royalty (on Net revenues) of 0 to 3% depending on mine production; The second is a 0 to 75% Royalty charge on Operating Profits, varying with the copper price. In detail, for mine production <50 ktpa Cu the AdVal Royalty is zero, rising to 1% if production is between 50 to 300 ktpa Cu, and 3% for mine production >300 ktpa Cu. The second Royalty applies to all sized mines. The Rate is set at zero when the copper price is <\$2.00/lb. At a price of \$2.00 to \$2.50/lb, \$2.50 to \$3.00/lb, \$3.50 to \$4.00/lb the rate is set at 15%, 35%, 50% and 60% respectively. At a metal price of >\$4.00/lb the Royalty is set at 75% of Operating Profits. Have assumed that the metal price increments are adjusted annually for inflation from a 2021 start-year
 - (m) In Ontario, new mines in remote areas can apply for 3-10 year tax holiday on Provincial Tax, and 5% rate thereafter. In the model I have assumed that the mine is not remote
 - (n) In Peru companies pay a "Modified Royalty Rate" plus a "Special Mining Tax" on copper and gold sales. The Modified Royalty Rate varies between 1% and 12% of Net Revenues, depending on the Profit Margin; The Special Mining Tax involves an additional 2% to 8.4% Tax on Operating Profits, with the rate varying depending on the % Operating Margin. For unprofitable mines a minimum amount payable is 1% NSR is payable
 - (o) In PNG a Resource Industry Profits Tax of 30% (on top of the Corporate income tax) applies to for those companies that receive a rate of return above 15% on Capital. For purposes of modelling have ignored this
 - (p) In New Mexico, the State calls Royalties a "Severance Tax". The rate is 1.1% of the taxable value of the metal produced
 - (q) In Nevada the Royalty Rate is on a sliding scale from 2 to 5% of Operating Profit depending on the Ratio of Net Proceeds to Gross Proceeds. If the ratio is less than 10% the the NSR Royalty is 2%. This increases to 2.5%, 3.0%, 3.5%, 4.0% and 4.5% if the ratio is between 10-18%, 18-26%, 26-34%, 34-42% and 42-50% respectively. Above 50%, the NSR Royalty is set at 5%
 - (r) In the United States resource companies can claim a 15% reduction in the Operating Profit for Depletion. This replaces the depreciation schedules. If an operating loss is made, the depletion allowance is zero - ie can't carry-forward the claim to future years
 - (s) In Canada, Shareholders in Junior companies can claim a tax deduction for exploration expenses incurred in the year. In other countries, unless the company has other local profitable operations, these losses are carried-forward and are only claimable when the mine goes into production. Given that less than 1 in 100 exploration projects are successful, and most companies don't have local mines, can assume that (in most cases) the expenditures are lost
 - (t) In Australia the Dividend Withholding Tax is 10%, but this is offset with prior payments of Corporate Tax Paid (ie have Franking Credits)
 - (u) In Canada the full rate for DWT is 25%, reducing to 5% for Treaty Countries
 - (v) High inflation rates erode the value of depreciation credits
 - (w) In Mongolia the Royalty Rate for copper varies from 0% to 15% (Gross Revenue basis) depending on the metal price. In detail, at a copper price of <\$5000/t, the rate is zero. At \$5000 to \$6000/t, \$6000 to \$7000/t, \$7000 to \$8000/t, \$8000 to \$9000/t the rate is 11%, 12%, 13% and 14% respectively. Above \$9000/t the rate is 15%. Have assumed that the metal price increments are adjusted annually for inflation from a 2021 start-year
 - (x) In Mongolia the Royalty Rate for gold varies from 0% to 5% (Gross Revenue basis) depending on the metal price. In detail, at a gold price of <\$900/oz, the rate is zero, At \$900 to \$1000/oz, \$1000 to \$1100/oz, \$1100 to \$1200/oz, \$1200 to \$1300/oz the rate is 1%, 2%, 3% and 4% respectively. Above \$1300/oz the rate is 5%. Have assumed that the metal price increments are adjusted annually for inflation from a 2021 start-year
 - (y) instead of VAT most US States have a Sales Tax (or more correctly a Gross Receipts Tax). In New Mexico and Nevada the rate is 5.125%, and 7.1% respectively - for consumable items purchased. Unlike VAT, this tax is not refundable against Tax collected on product sold
 - (z) In Brazil the VAT is called Imposto sobre Operações relativas à Circulação de Mercadorias e sobre Prestações de Serviços de Transporte Interestadual e Intermunicipal e de Comunicação) (ICMS). The ICMS rate varies depending on the goods or the services transacted, as well as on the specific regulations of each state (the average rate is 18%). The ICMS is similar to value added tax (VAT) adopted in European jurisdictions. ICMS is also levied even if the transactions and/or rendering of services begins abroad
 - (aa) In the case of the United States and China assume all capex equipment and consumables are locally sourced ... and so import duties are not applicable
 - (ab) The Import Duty is 6% but (under the terms of the Free Trade Agreement between Chile and the United States) purchases from the US have zero duty
 - (ac) Made up of Contributions to the Social Integration Programme levied on imports (COFINS-Import) and Social Security Financing Contribution levied on imports (PIS-Import) which are generally levied on the entrance of foreign goods into Brazil and on the importation of services. Together they total 9.25%
 - (ad) In The DRC The following taxes are collected at the time of the import and/or export of goods; Administrative payment: 2% of the CIF value; Congolese Control Office (OCC) payments: 1.5% of the CIF value, plus various other administrative charges; Office de Gestion du Fret Maritime (OGEFREM) payment: 0.58% of the CIF value; Funds for the Promotion of Industry (FPI) charge: 2% of the CIF value and (for Exports only) cost of inspection from the Bureau of Inspection, Valuation, Assessment, and Control (BIVAC): 1.5% of the free on board (FOB) value
 - (ae) In PNG (based on recent case for the Ramu Nicke Project) the developer can get an exemption on Import Duty
 - (af) The DEFAULT CASE data is used as the basis for calculating the *Effective Tax Rate* for the various countries and jurisdictions

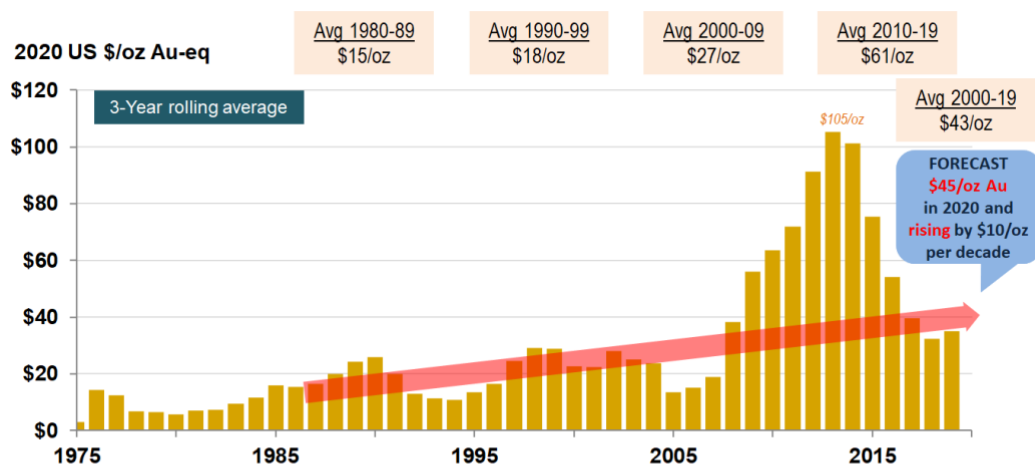
Appendix B: Average Unit Discovery Costs for Copper and Gold



Note: Based on primary copper deposits containing >0.1 Mt Cu
Data from 2009 onwards have been adjusted for unreported discoveries

Source: MinEx Consulting © April 2021

Figure B1. Trend Average Unit Discovery Cost for Copper: World: 1975-2019



Note: Includes gold-equivalent value of base metal and other credits associated with the primary gold deposit
Data from 2009 onwards have been adjusted for unreported discoveries

Source: MinEx Consulting © April 2021

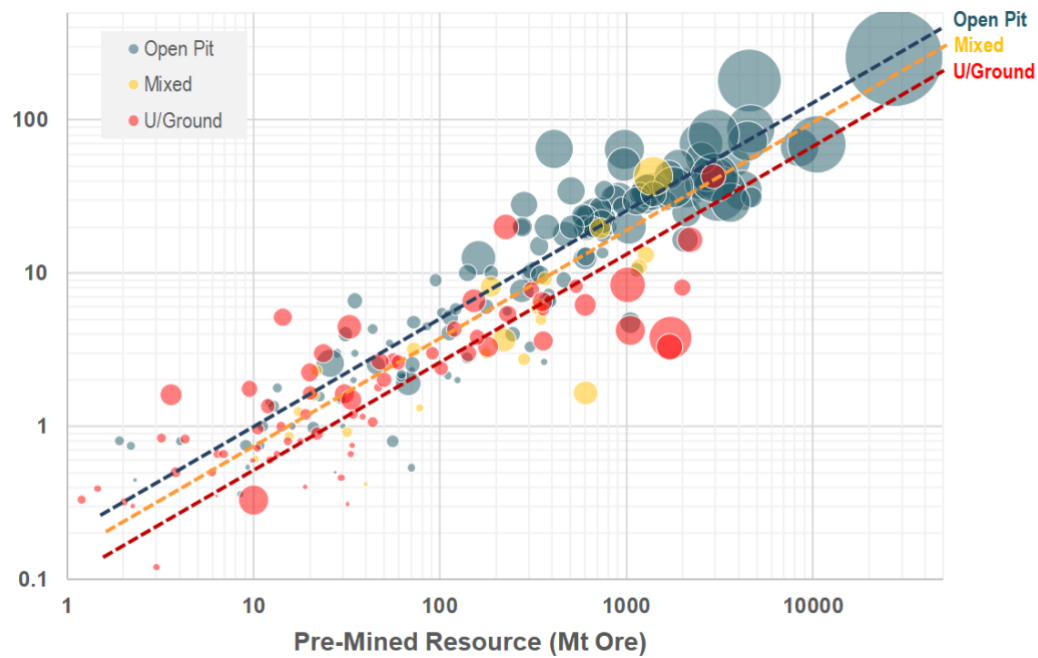
Figure B2. Trend Average Unit Discovery Cost for Gold: World: 1975-2019

Appendix C: Estimated Mining Rates, Capital & Operating Costs for Copper and Gold Projects

The following set of charts were generated from data compiled scoping and feasibility studies for 250 major stand-alone copper project and 372 gold projects around the World, published since 1985. The original reported cost numbers have been adjusted to constant 2021 US Dollars using the cumulative US CPI inflation rate.

Assumes that the project is stand-alone.

Mining Rate (Mtpa Ore)

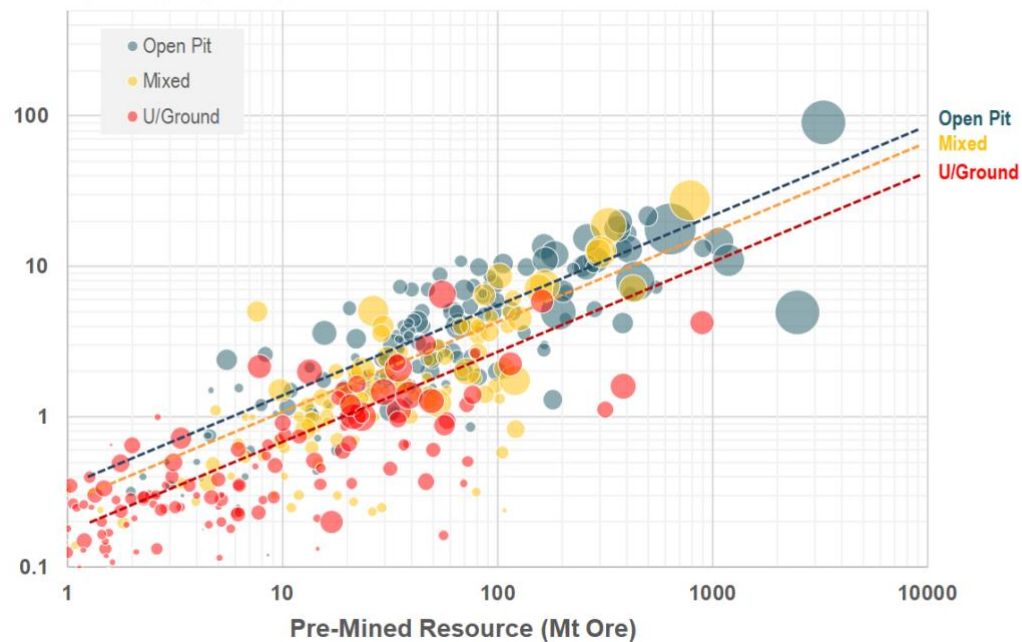


Note: Bubble-size refers to gold production (ktpa Cu)

Source: MinEx Consulting © April 2021

Figure C1. Mining rate versus Size of Resource for Copper Projects in the World

Mining Rate (Mtpa Ore)

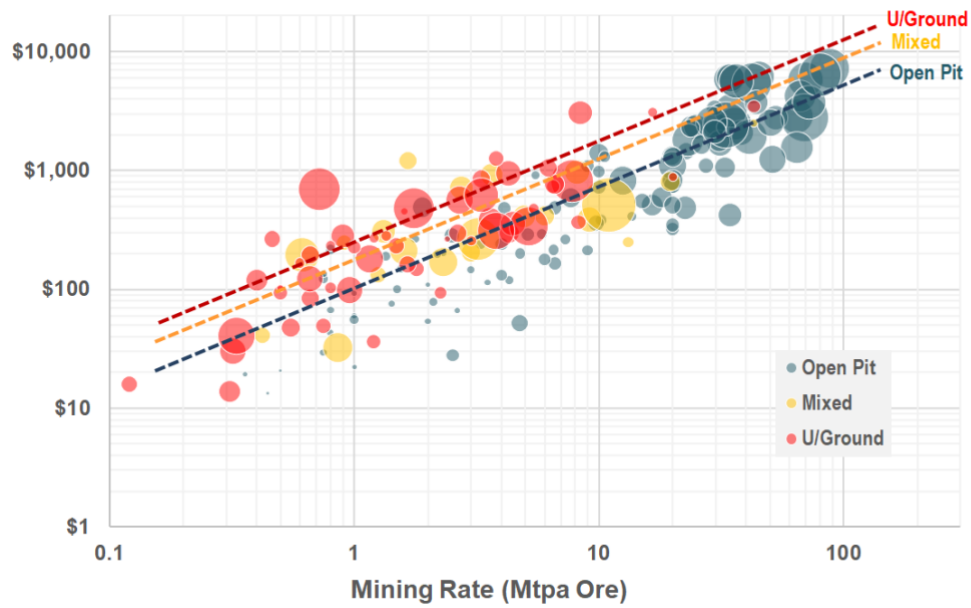


Note: Bubble-size refers to gold production (koz pa Au)

Source: MinEx Consulting © April 2021

Figure C2. Mining rate versus Size of Resource for Gold Projects in the World

Capex Cost (2021 US\$m)

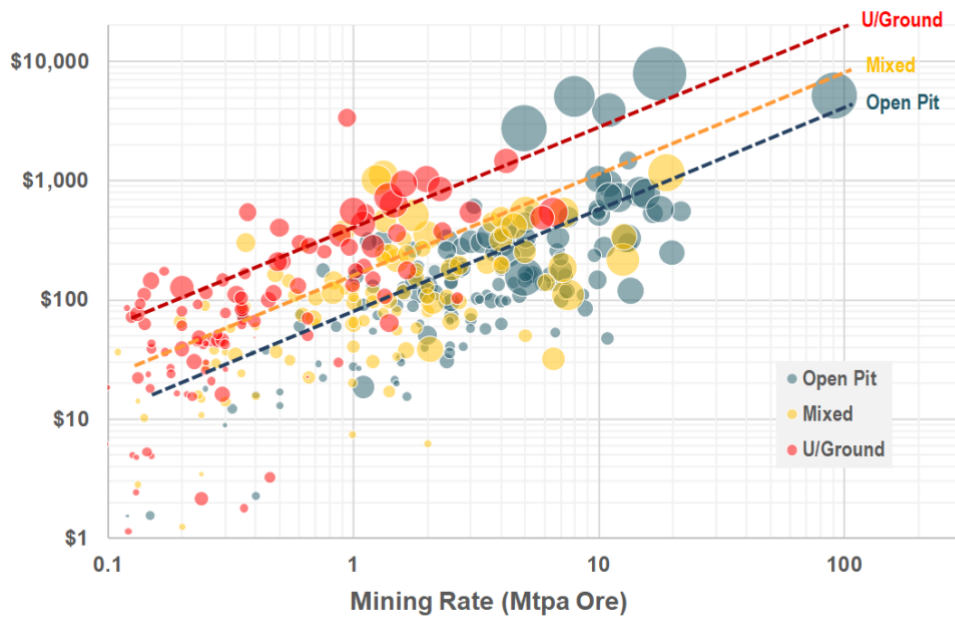


Note: Bubble-size refers to gold production (kt pa Cu)

Source: MinEx Consulting © April 2021

Figure C3. Capital Cost versus Mining Rate for Copper Projects in the World

Capex Cost (2021 US\$m)

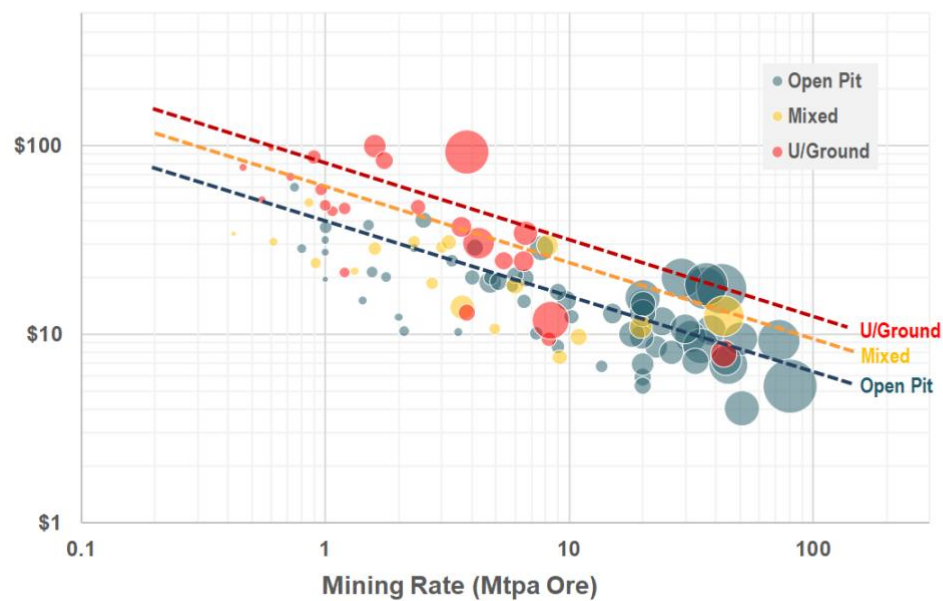


Note: Bubble-size refers to gold production (koz pa Au)

Source: MinEx Consulting © April 2021

Figure C4. Capital Cost versus Mining Rate for Gold Projects in the World

Operating Cost (2021 US\$/t Ore)

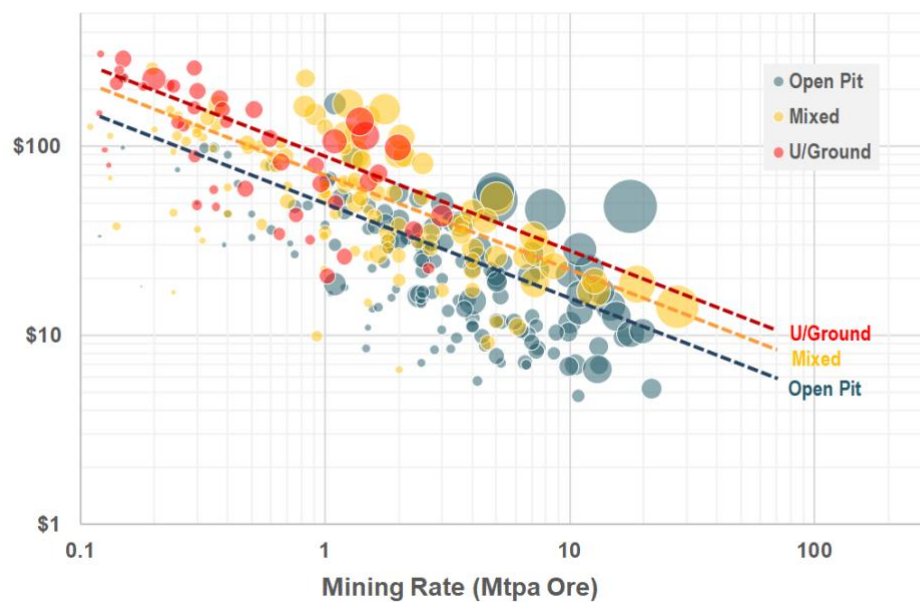


Note: Bubble-size refers to gold production (kt pa Cu)

Source: MinEx Consulting © April 2021

Figure C5. Operating Cost versus Mining Rate for Copper Projects in the World

Operating Cost (2021 US\$/t Ore)



Note: Bubble-size refers to gold production (koz pa Au)

Source: MinEx Consulting © April 2021

Figure C6. Operating Cost versus Mining Rate for Gold Projects in the World

Appendix D: Estimated Recovery Rates for Copper and Gold Projects

The following set of charts were generated from data compiled from data on 185 copper and 511 gold mines and projects around the World, circa 2020.

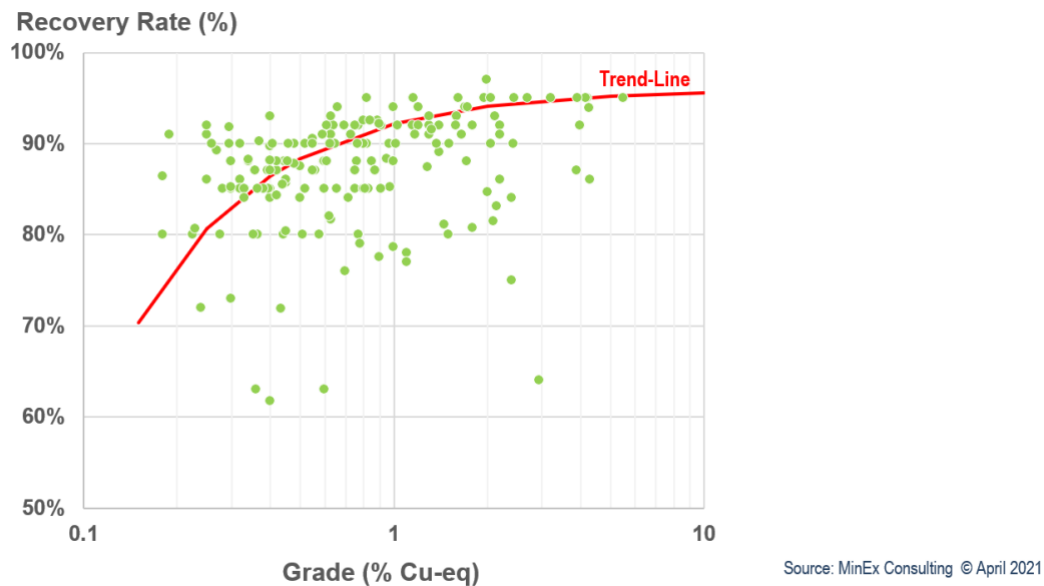


Figure D1. Recovery rate versus Head Grade for Copper Mines & Projects in the World

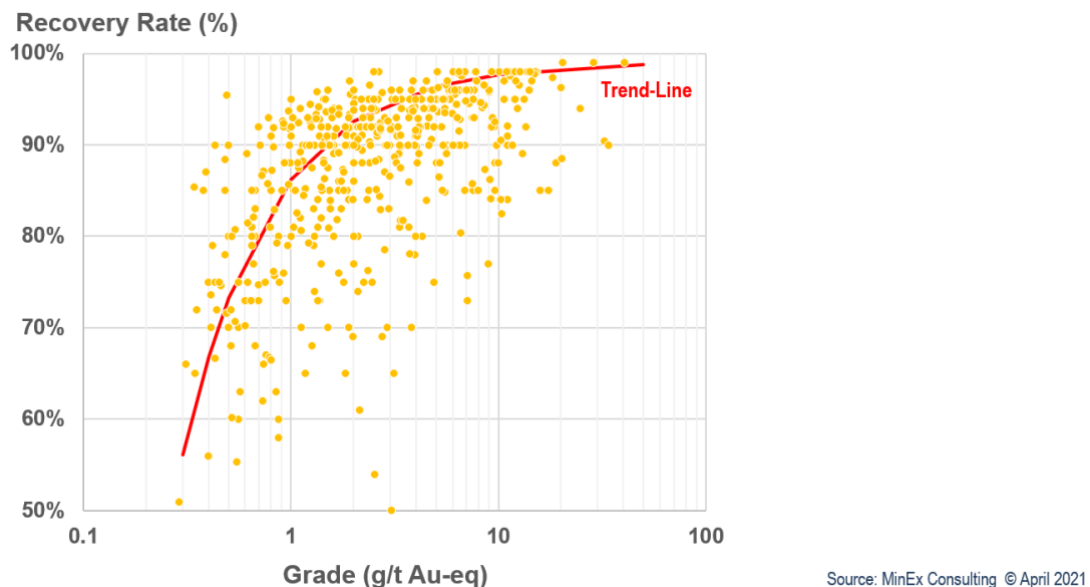


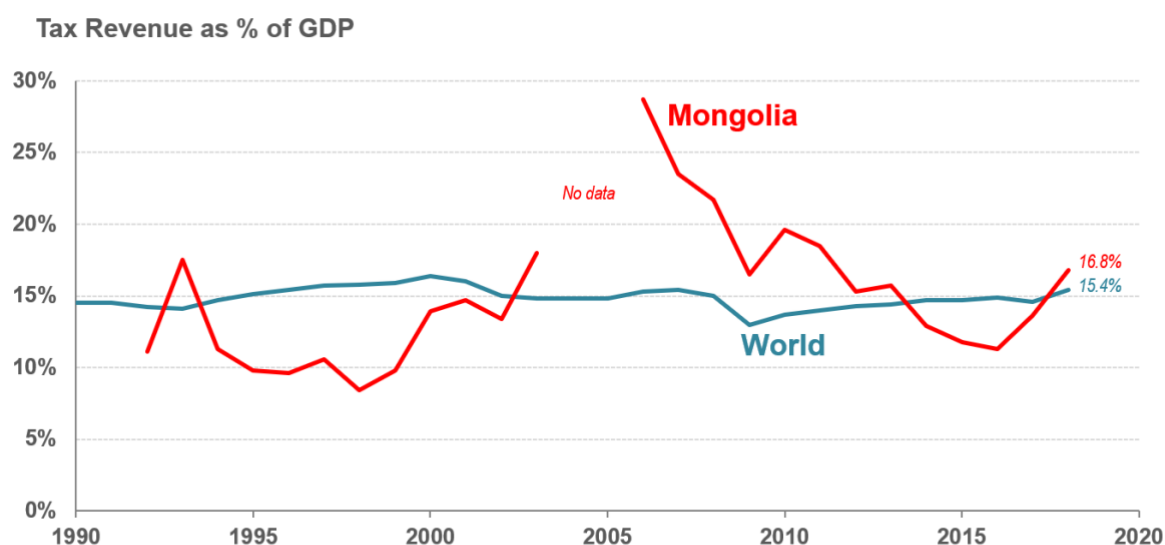
Figure D2. Recovery rate versus Head Grade for Gold Mines & Projects in the World

Appendix E: Estimated Level of Indirect Taxes Captured from Mining Activities

In addition to the Taxes and Royalties paid by the company directly to the Government, **assume that ~15% of the Operating Expenditures incurred at the mine site eventually ends up as additional Tax Revenue to the Mongolian Government.** This comes from taxes from wages of employees and contractors, as well as profits generated by third parties selling goods & services to the mine.

According to Wikipedia¹³ Gross Domestic Product (GDP), is a monetary measure of the market value of all the final goods and services produced in a specific time period. The most common calculation method involves determining the collective “Value Added” to the economy from the various activities carried out in the country. As a first-pass estimate it is assumed that that the direct operating expenditures at the mine generate value-add elsewhere in the economy.

Apart from expenditures on infrastructure (such as roads and power, which require a large import from local construction companies) assume that all of the capital items are imported, and so generate little economic activity within the country.

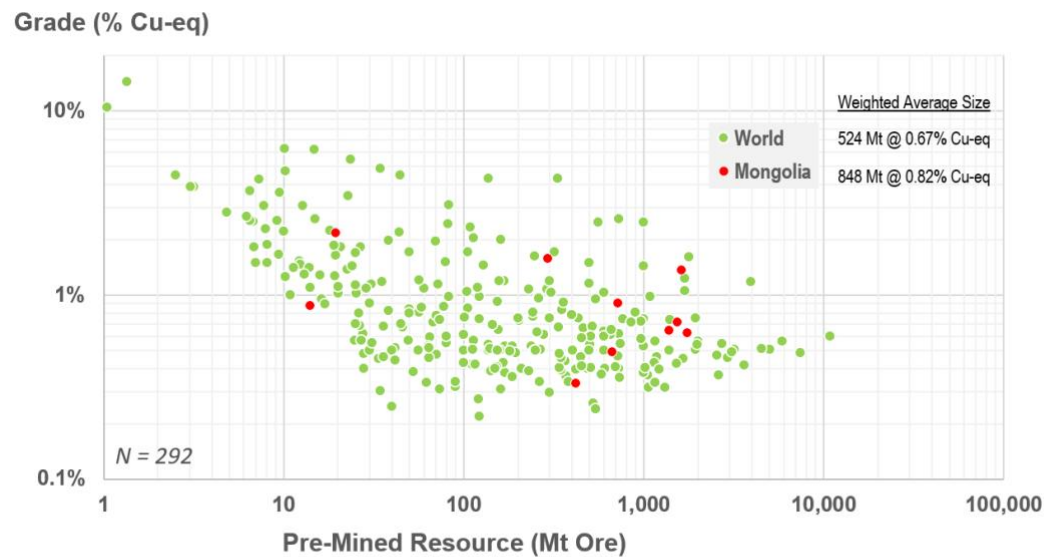


Source: World Bank June 2021

Figure E1. Tax Revenue as a Percentage of GDP: 1990-2018

¹³ Source: https://en.wikipedia.org/wiki/Gross_domestic_product

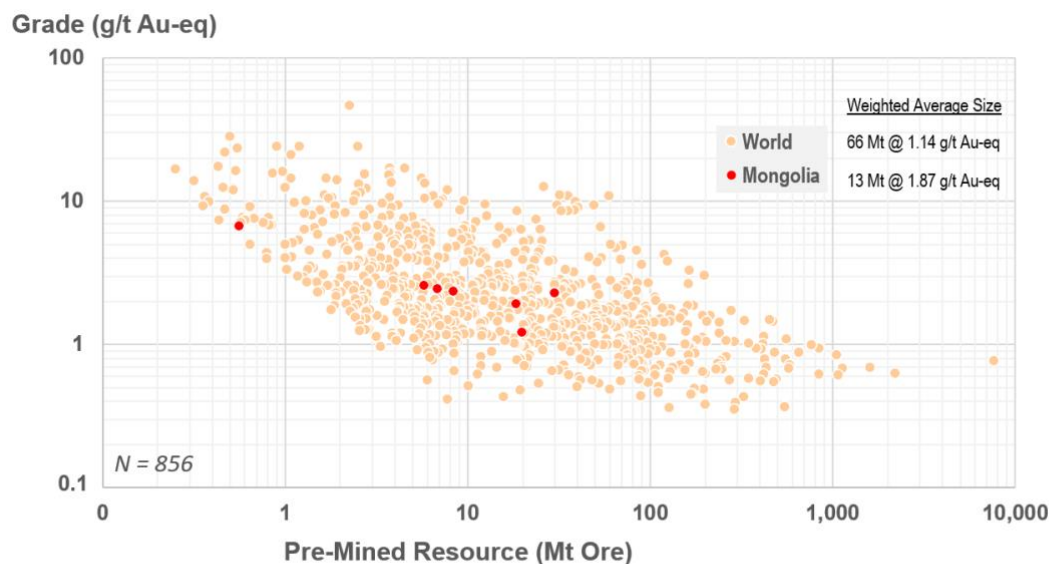
Appendix F: Estimated Break-even Grades for Open Pit & Underground Copper and Gold Mines



Source: MinEx Consulting © April 2022

Note: Limited to primary copper deposits containing >0.1 Mt Cu-eq
Have adjusted the copper grade for the value of any credits from by-product metal (such as Au, Ag, Mo etc)

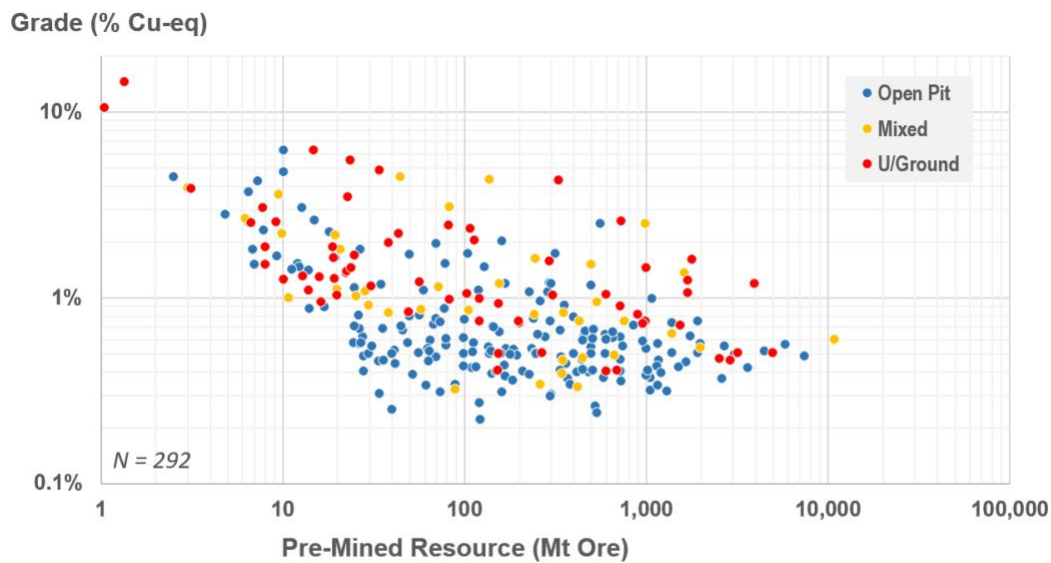
Figure F1. Tonnes-Grade for Copper Deposits found in the World: 1995-2019



Source: MinEx Consulting © April 2022

Note: Limited to primary gold deposits containing >0.1 Moz Au-eq
Have adjusted the gold grade for the value of any credits from by-product metal (such as Cu, Ag etc)

Figure F2. Tonnes-Grade for Gold Deposits found in the World: 1995-2019

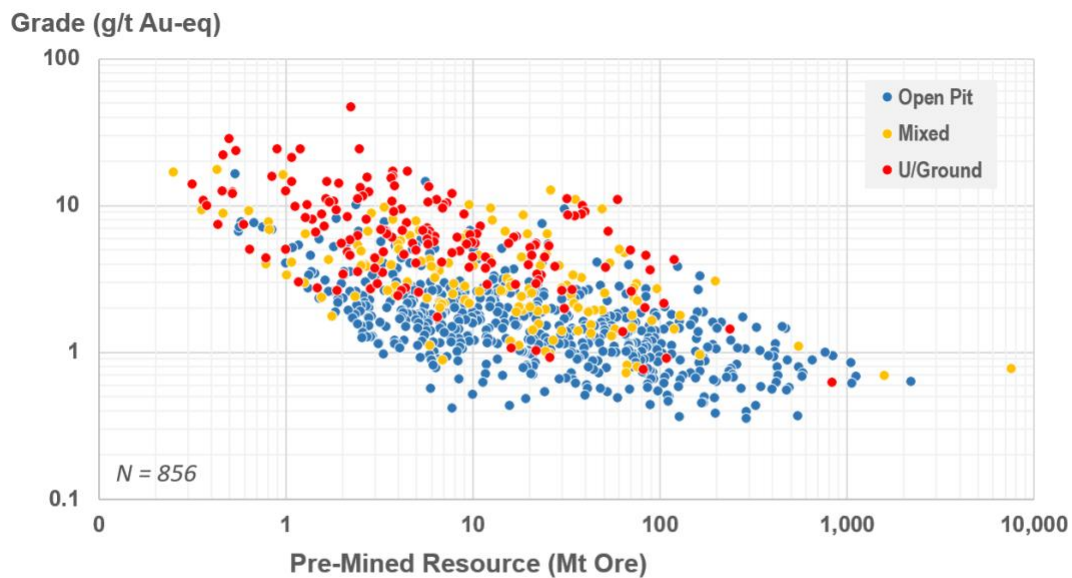


Source: MinEx Consulting © April 2022

Note: Limited to primary copper deposits containing >0.1 Mt Cu-eq

Have adjusted the copper grade for the value of any credits from by-product metal (such as Au, Ag, Mo etc)

Figure F3. Tonnes-Grade & Mining Method for Copper Deposits found in the World 1995-2019

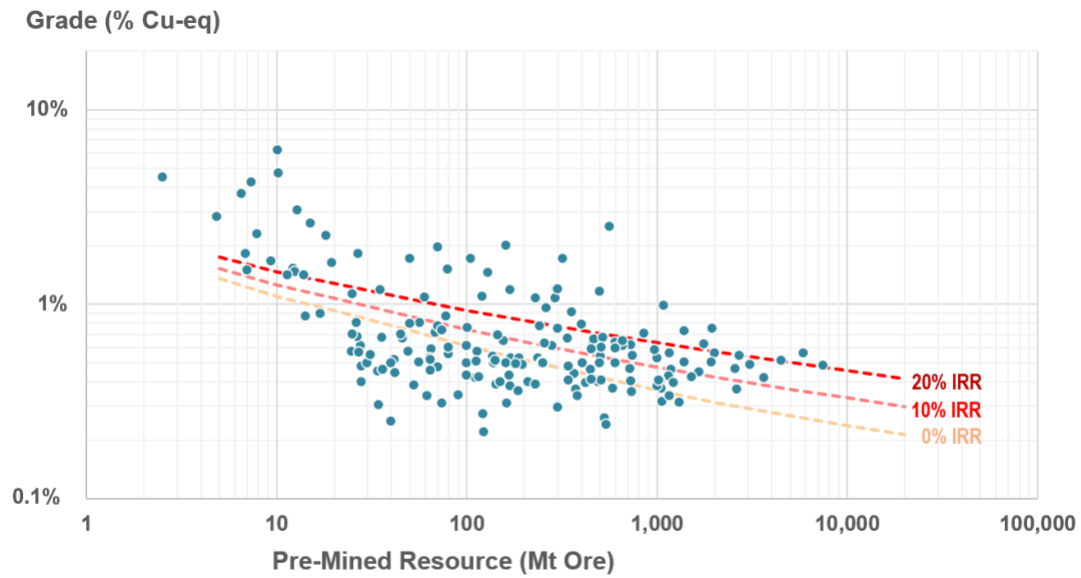


Source: MinEx Consulting © April 2022

Note: Limited to primary copper deposits containing >0.1 Mt Cu-eq

Have adjusted the copper grade for the value of any credits from by-product metal (such as Au, Ag, Mo etc)

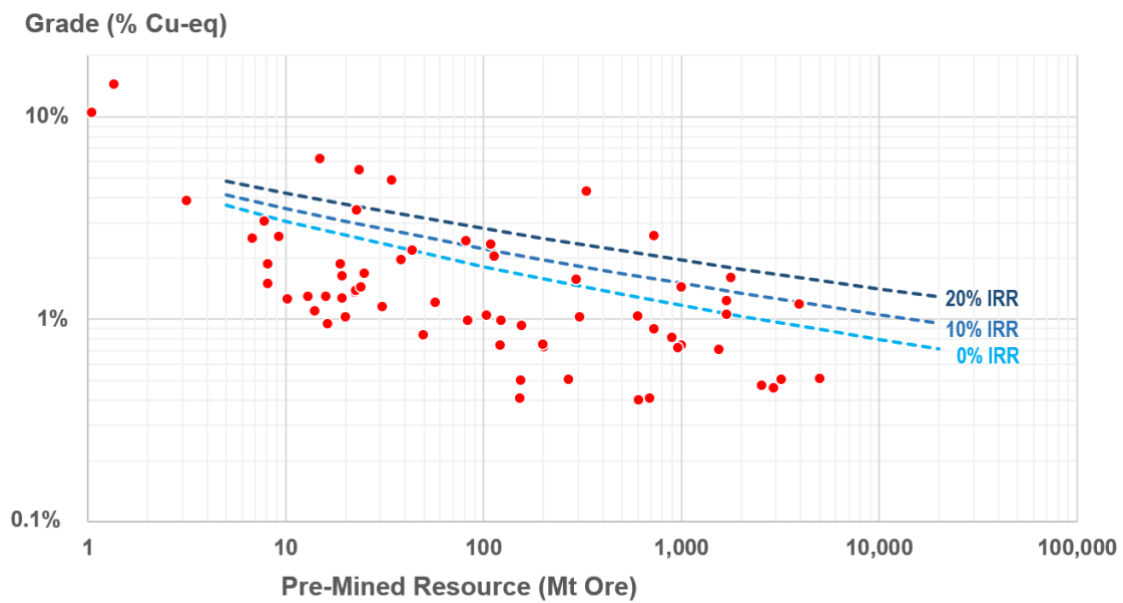
Figure F4. Tonnes-Grade & Mining Method for Gold Deposits found in the World 1995-2019



Note: Analysis based on 30% Corporate Tax Rate, no Royalties, \$3.00/lb Cu

Source: MinEx Consulting © April 2022

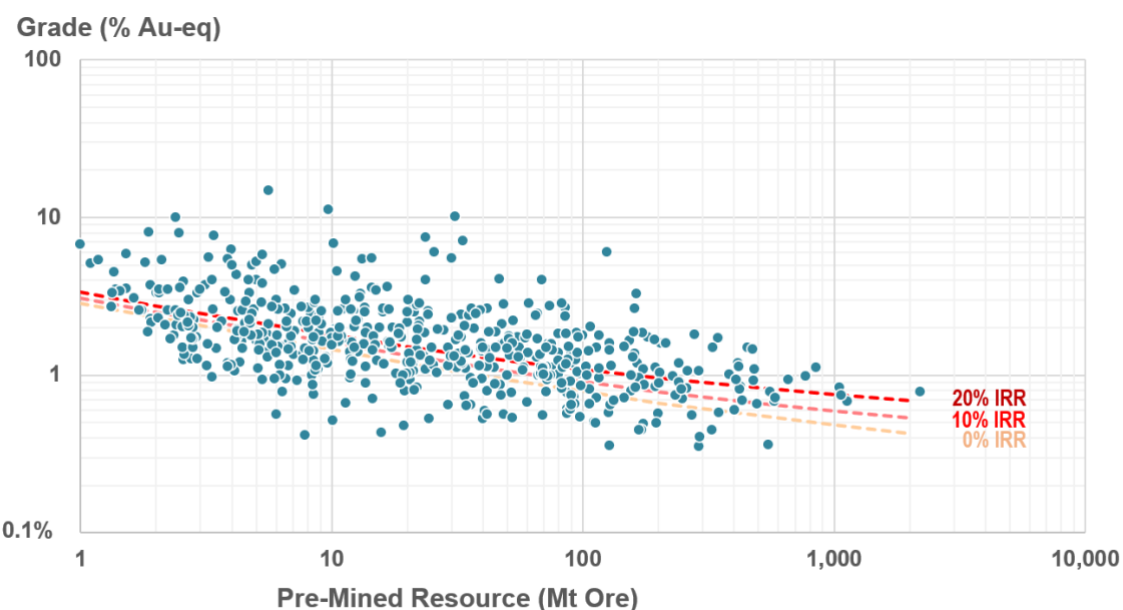
Figure F5. Break-Even Tonnes-Grade at the Decision-to-Build Stage for Open Pit Copper Deposits found in the World: 1995-2019



Note: Analysis based on 30% Corporate Tax Rate, no Royalties, \$3.00/lb Cu

Source: MinEx Consulting © April 2022

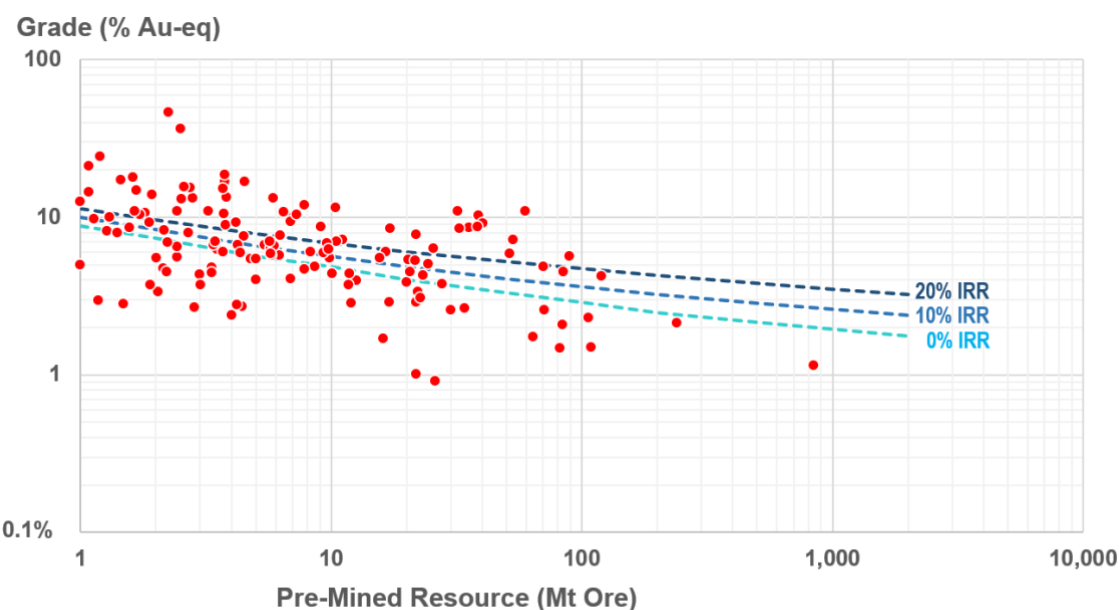
Figure F6. Break-Even Tonnes-Grade at the Decision-to-Build Stage for Underground Copper Deposits found in the World: 1995-2019



Note: Analysis based on 30% Corporate Tax Rate, no Royalties, \$1500/oz Au

Source: MinEx Consulting © April 2022

Figure F7. Break-Even Tonnes-Grade at the Decision-to-Build Stage for Open Pit Gold Deposits found in the World: 1995-2019



Note: Analysis based on 30% Corporate Tax Rate, no Royalties, \$1500/oz Au

Source: MinEx Consulting © April 2022

Figure F8. Break-Even Tonnes-Grade at the Decision-to-Build Stage for Underground Gold Deposits found in the World: 1995-2019

Appendix G: Estimated Optimum Tax Rate for Copper and Gold Projects by Stage of Development and Range of Business Risk

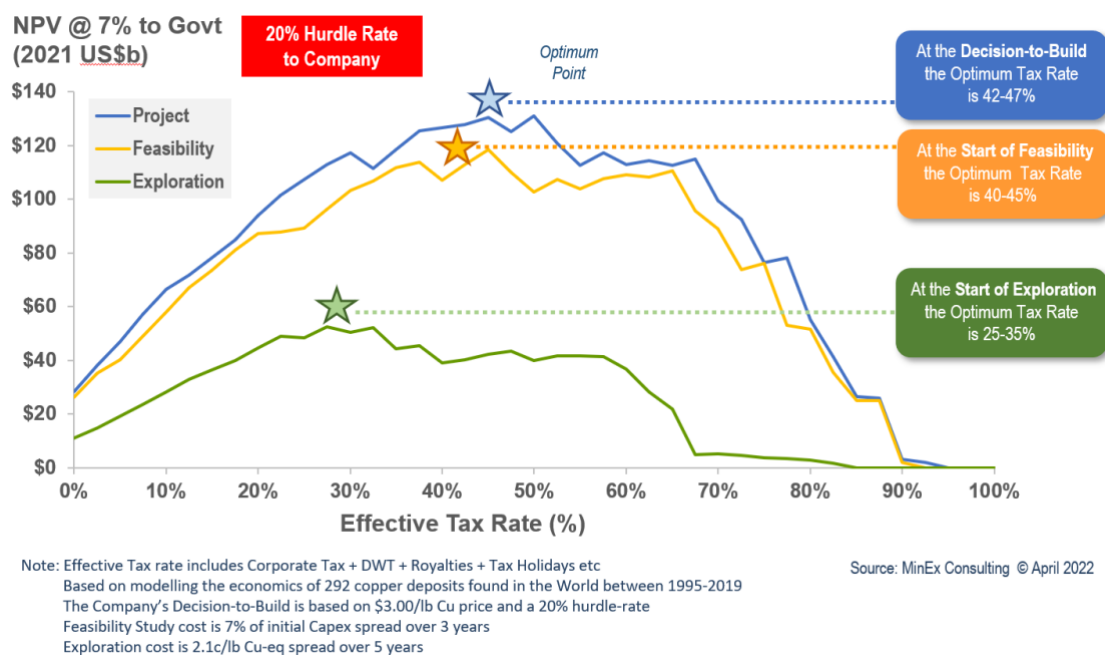


Figure G1. NPV to Government for Copper Projects – by Stage of Development
20% Hurdle Rate

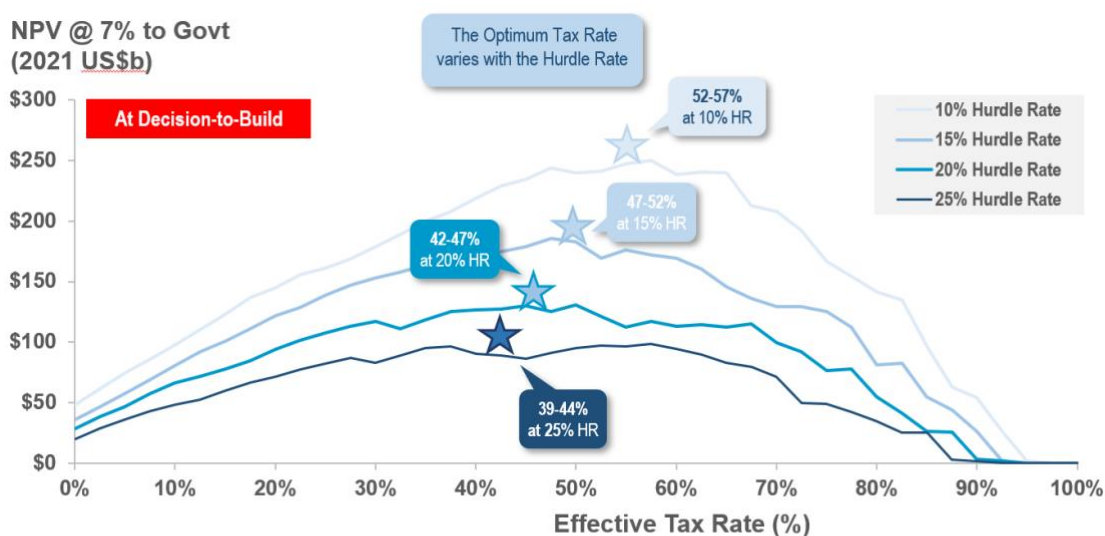
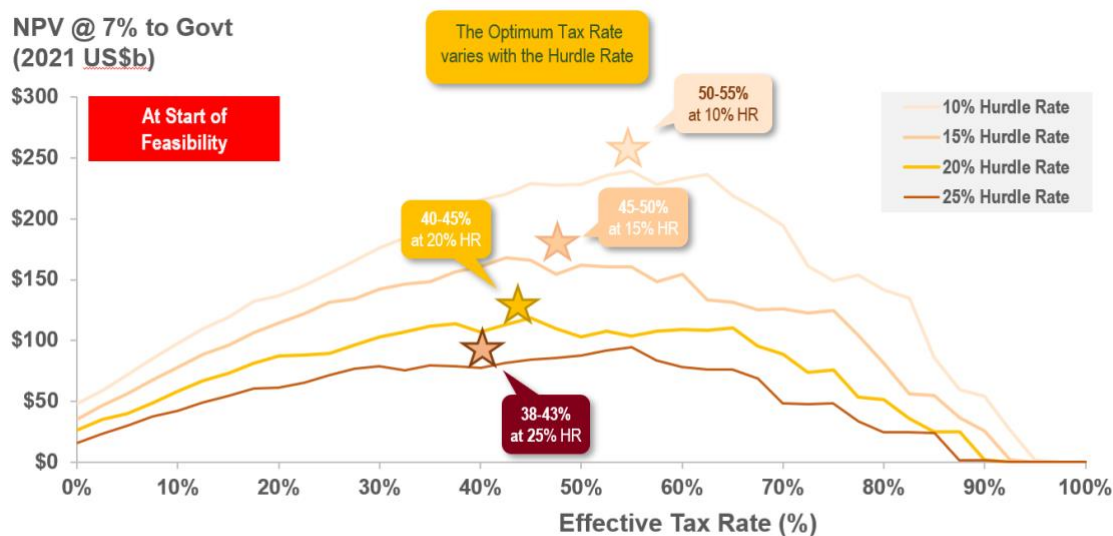


Figure G2. Effect of Business Risk on the Optimum Tax Rate to Government for Copper Projects – at Decision-to-Build



Note: Effective Tax rate includes Corporate Tax + Royalties + Tax Holidays etc
 Based on modelling the economics of 292 copper deposits found in the World between 1995-2019
 The Company's Decision-to-Build is based on \$3.00/lb Cu price
 Feasibility Study cost is 7% of initial Capex spread over 3 years
 Exploration cost is 2.1c/lb Cu-eq spread over 5 years

Source: MinEx Consulting © April 2022

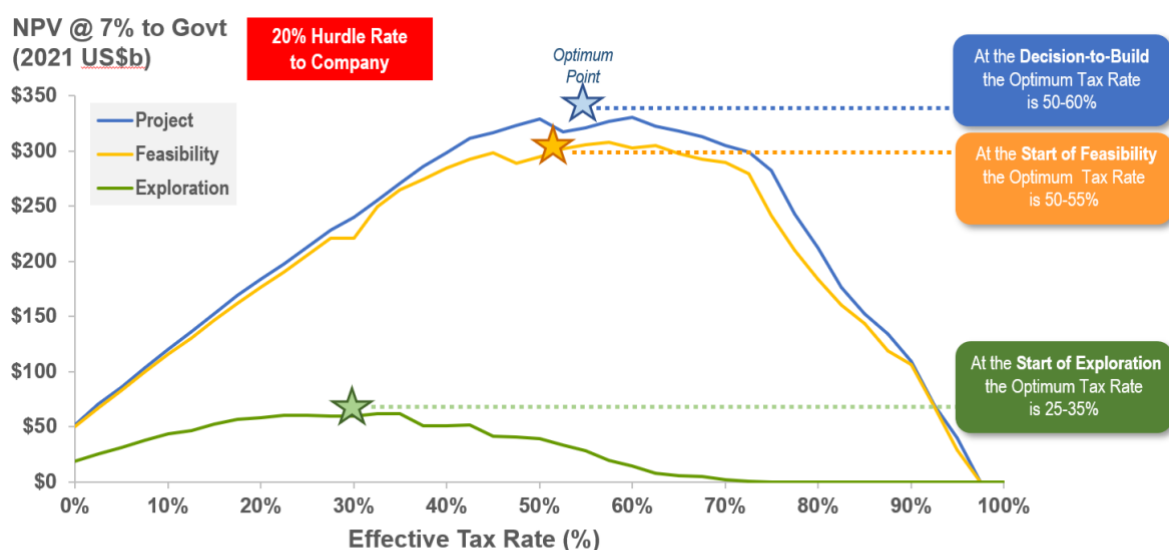
Figure G3. Effect of Business Risk on the Optimum Tax Rate to Government for Copper Projects – at Start-of-Feasibility



Note: Effective Tax rate includes Corporate Tax + Royalties + Tax Holidays etc
 Based on modelling the economics of 292 copper deposits found in the World between 1995-2019
 The Company's Decision-to-Build is based on \$3.00/lb Cu price
 Feasibility Study cost is 7% of initial Capex spread over 3 years
 Exploration cost is 2.1c/lb Cu-eq spread over 5 years

Source: MinEx Consulting © April 2022

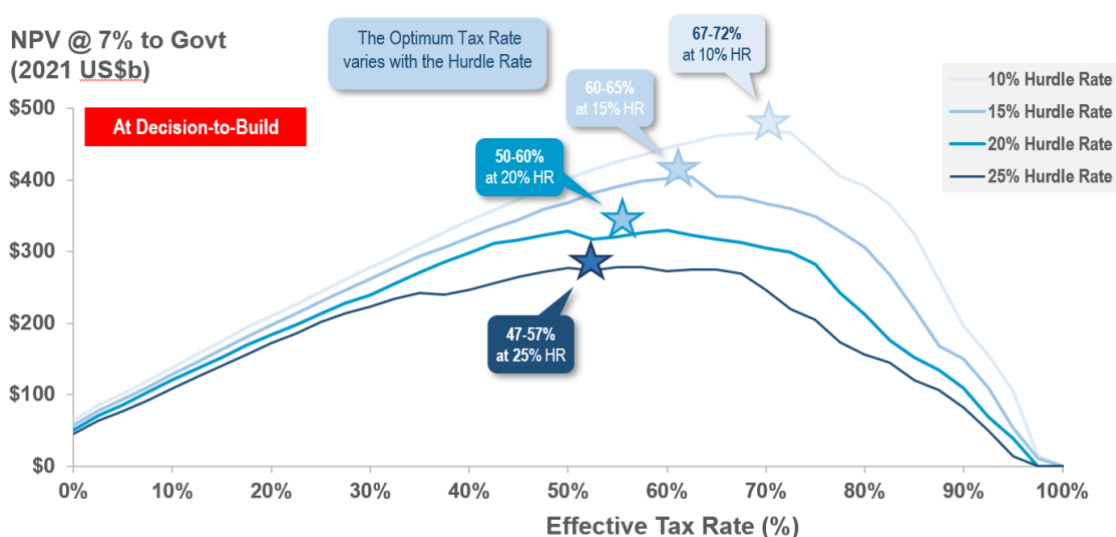
Figure G4. Effect of Business Risk on the Optimum Tax Rate to Government for Copper Projects – at Start-of-Exploration



Note: Effective Tax rate includes Corporate Tax + DWT + Royalties + Tax Holidays etc
 Based on modelling the economics of 848 gold deposits found in the World between 1995-2019
 The Company's Decision-to-Build is based on \$1500/oz Au price and a 20% hurdle-rate
 Feasibility Study cost is 7% of initial Capex spread over 3 years
 Exploration cost is \$50/oz Au-eq spread over 5 years

Source: MinEx Consulting © April 2022

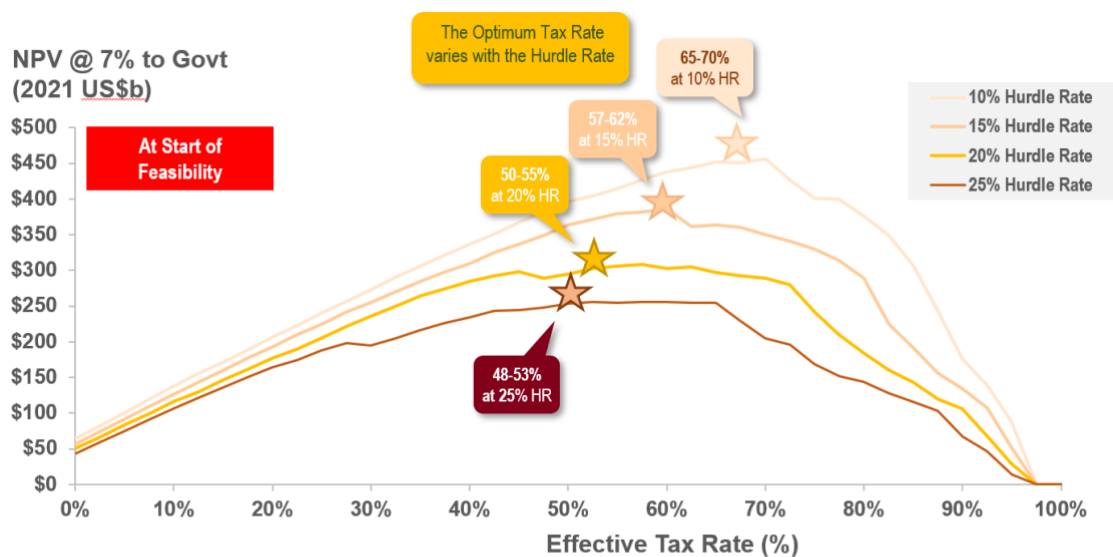
Figure G5. NPV to Government for Gold Projects – by Stage of Development
 20% Hurdle Rate



Note: Effective Tax rate includes Corporate Tax + Royalties + Tax Holidays etc
 Based on modelling the economics of 848 gold deposits found in the World between 1995-2019
 The Company's Decision-to-Build is based on \$1500/oz Au price
 Feasibility Study cost is 7% of initial Capex spread over 3 years
 Exploration cost is \$50/oz Au-eq spread over 5 years

Source: MinEx Consulting © April 2022

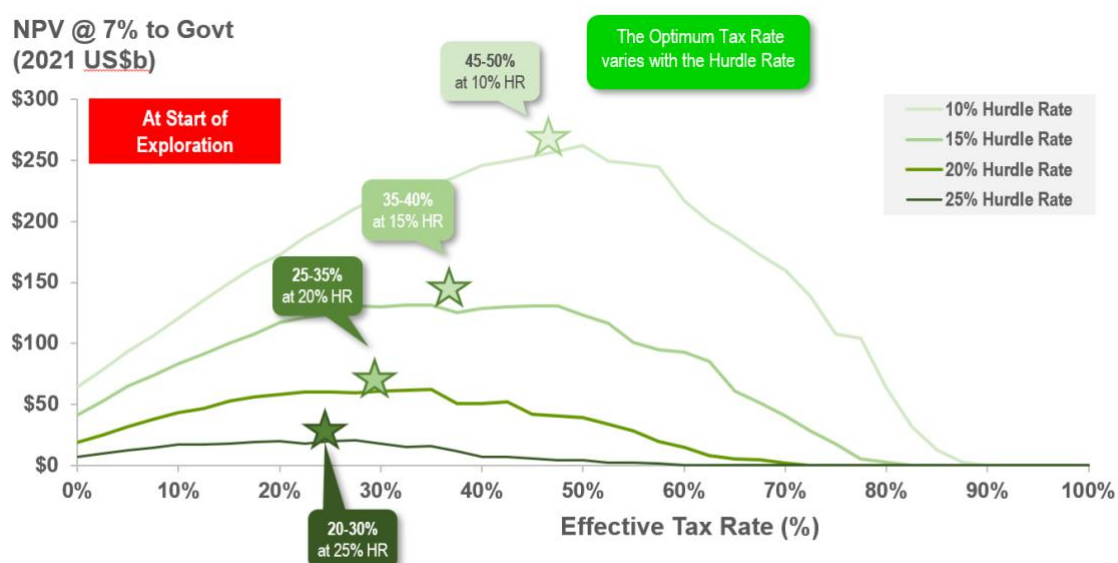
Figure G6. Effect of Business Risk on the Optimum Tax Rate to Government for
 Gold Projects – at Decision-to-Build



Note: Effective Tax rate includes Corporate Tax + DWT + Royalties + Tax Holidays etc
Based on modelling the economics of 848 gold deposits found in the World between 1995-2019
The Company's Decision-to-Build is based on \$1500/oz Au price and a 20% hurdle-rate
Feasibility Study cost is 7% of initial Capex spread over 3 years
Exploration cost is \$50/oz Au-eq spread over 5 years

Source: MinEx Consulting © April 2022

Figure G7. Effect of Business Risk on the Optimum Tax Rate to Government for Gold Projects – at Start-of-Feasibility



Note: Effective Tax rate includes Corporate Tax + Royalties + Tax Holidays etc
Based on modelling the economics of 848 gold deposits found in the World between 1995-2019
The Company's Decision-to-Build is based on \$1500/oz Au price
Feasibility Study cost is 7% of initial Capex spread over 3 years
Exploration cost is \$50/oz Au-eq spread over 5 years

Source: MinEx Consulting © April 2022

Figure G8. Effect of Business Risk on the Optimum Tax Rate to Government for Gold Projects – at Start-of-Exploration

Appendix H: Indicative Capital & Operating costs for a Copper Mine in 20 Countries

The following charts were compiled by MinEx Consulting in 2019. They are based on a hypothetical stand-alone open pit copper mine. The mine has a stripping ratio of 2:1 and produces 28 Mtpa of ore.

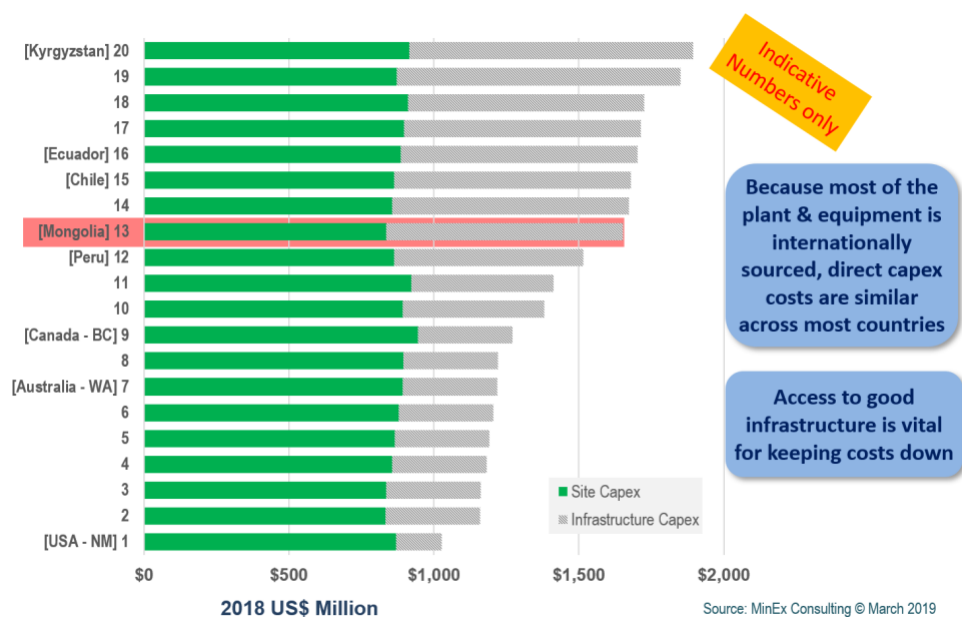


Figure H1. Estimated Capital Cost for a 28 Mtpa open pit copper mine

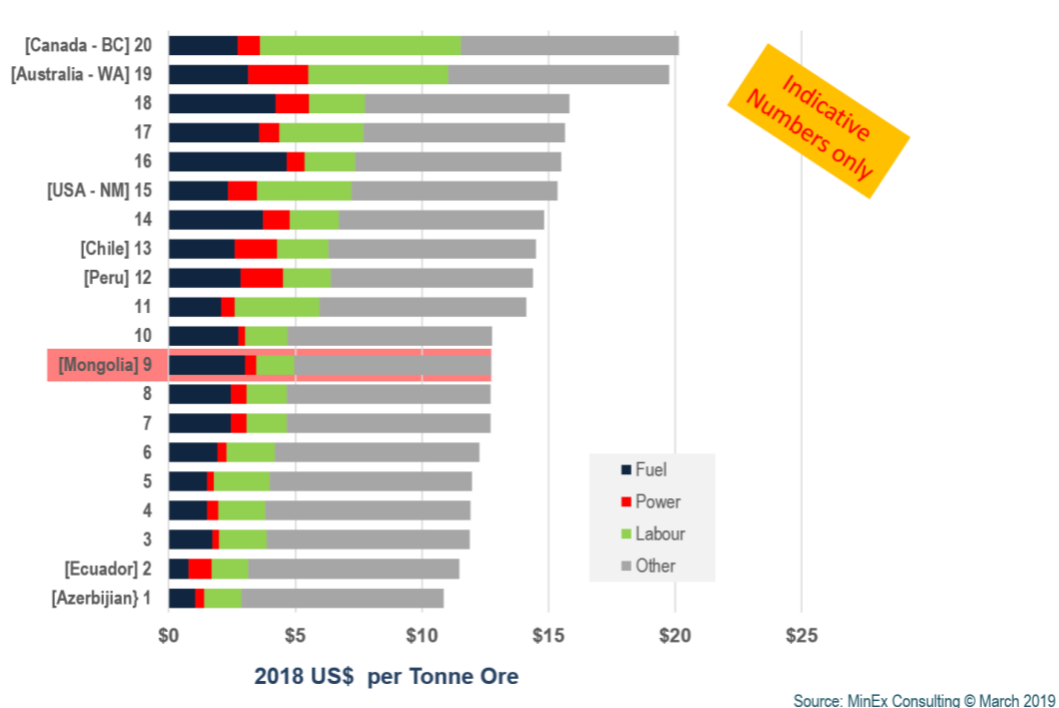


Figure H2. Estimated Operating Cost for a 28 Mtpa open pit copper mine

Figures 6.3 and 6.4 plot the value-curves for copper and gold at the Start-of-Exploration using a 20% Hurdle Rate. Overlain on this is the Effective Tax Rate for Mongolia of 36-37%. The ETR was calculated using Mongolia's current tax and Royalty rate (of 30% and 5% NSR respectively)¹⁴ It is interesting to note that current ETR of 37% for Mongolia falls mid-way between the optimum ETR for copper the Start-of-Exploration (25 to 35%) and the Start-of-Feasibility (40 to 45%). This suggests that the current ETR for copper projects is set at a level that sustains the industry. Notwithstanding this, as modest reduction in the ETR by (say) 5 percentage-points to encourage additional exploration will certainly help grow the industry. A similar situation applies to gold projects in Mongolia. the current ETR of 37% falls between the optimum ETR for gold at the Start-of-Exploration (25 to 35%) and the Start-of-Feasibility (50-55%).

Figure 13. Effect of Tax Rate on the Distribution of Wealth for Copper Projects found in the World: 1995-2019

¹⁴ The 36-37% rate was calculated by economic modelling of 292 copper and 856 gold projects discovered in the world since 1995. The rate matches that calculated in Section 4 - which was based on 4 hypothetical deposits.

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