

# GOLD PRODUCTION OVER THE PAST & NEXT 25 YEARS<sup>1</sup>

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Courtesy of  
Agnico Eagle Mines.

Historically, global gold mine production was dominated by South Africa, the United States, Australia and Canada. In 1995, these four countries accounted for 56% of annual gold production (GFMS – Gold Survey). However, over the past 25 years, there has been a significant geographical diversification of mined gold supply, with the contribution of these four countries dropping to 24% in 2020.

## THE PAST 25 YEARS OF GOLD PRODUCTION

Alongside this diversification of supply, there has been substantial growth in global output over the same 25-year period. In 1995, global mined gold production was 2,299 tonnes (GFMS – Gold Survey). By 2018, this had increased by 55% to a new all-time high of 3,556 tonnes. This increase largely took place from the late 2000s, driven by a relentlessly rising gold price, which peaked in 2011 to levels that were not surpassed until August last year. A significant proportion of this production growth has come from China and Russia. China surpassed South Africa in 2007 to become the largest gold producer globally and has remained in that position since. Meanwhile, Russia surpassed Australia to become the second-biggest producer in 2019. Last year, China and Russia are estimated to have produced 364 tonnes and 341 tonnes respectively, which will see them maintain their positions as the top two gold-producing countries.

**CHINA AND RUSSIA  
ARE ESTIMATED  
TO MAINTAIN  
THEIR POSITIONS  
AS THE TOP TWO  
GOLD-PRODUCING  
COUNTRIES**

Alongside the incentive from higher prices, developing nations have opened up to foreign investment, leading to a significant increase in gold production from Africa, South East Asia, and Central and South America. Conversely, output from South Africa has been in perpetual decline over the last 25 years, with gold production in 2020 estimated to be 107 tonnes, down from 554 tonnes in 1995. This substantial decline is a result of the diminishing economic viability of South African mines. Average grades have declined over the years, while extracting ore from these deep and narrow deposits is both labour and energy intensive, leading to high fixed costs. These challenges have been well known for some time and have been written about several times in the *Alchemist* over the last 25 years. For example, Kelvin Williams, then Executive Director of Marketing at AngloGold Limited, wrote in detail about the challenges faced by gold miners in South Africa (see *Alchemist 11, October 1998, 'South Africa's Gold Mining Challenge'*) This decline now means that South Africa is no longer the biggest producer in Africa, with Ghana becoming the largest gold producer on the continent in 2018.

2020 was a challenging year for gold miners as the COVID-19 pandemic led to multiple countries introducing lockdown policies that required mining to be temporarily halted. This impacted output from several major producing countries such as Canada, China, South Africa, Peru and Mexico.

As a result, global gold production is estimated to have declined by 4% year-on-year. Despite the ongoing pandemic, disruption to miners has eased as they have been able to implement policies and procedures to monitor and halt the spread of the virus at their operations. This disruption will ease further as vaccines are rolled out globally and, as a result, we can expect a return to production growth this year. But what is the outlook further ahead, are current production levels sustainable over the next 25 years?

<sup>1</sup> This article is an update to Metals Focus's contribution to the World Gold Council's May 2018 report, *Gold 2048: The next 30 years for gold*.

To assess this, a number of factors need to be considered, including reserves and resources, price-cost dynamics, exploration expenditure and ESG/carbon footprint considerations.

It is often just a case of being more economic to incur the cost of converting resources to reserves closer to the time when the material will be needed for production. This is particularly the case for

underground mines, where development work and production can provide better access to the deposit for the required additional exploration drilling, compared to the greater expense of drilling deep exploration holes from the surface.

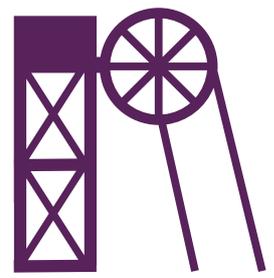
The remaining 30% of resources, which can be attributed to development projects, is less likely to contribute to production. Some of the gold in this

material will be marginal to extract and companies will often prefer to divert resources into discovering and developing more profitable deposits.

### PRICE, COSTS AND CAPITAL EXPENDITURE

In order to sustain production at or above current levels, significant capital will need to be deployed by miners in order to develop projects or expand existing operations to offset declining production from aging mines. With current prices, which at time of writing are around \$1,850/oz, well in excess of the 90<sup>th</sup> percentile of the all-in sustaining cost curve, which sits at \$1,300/oz, the vast majority of gold mines are making very healthy

profits. These margins should allow the industry to deploy capital to develop new projects, with the average capital cost to construct a new gold mine approximately \$200/oz over the life of mine.



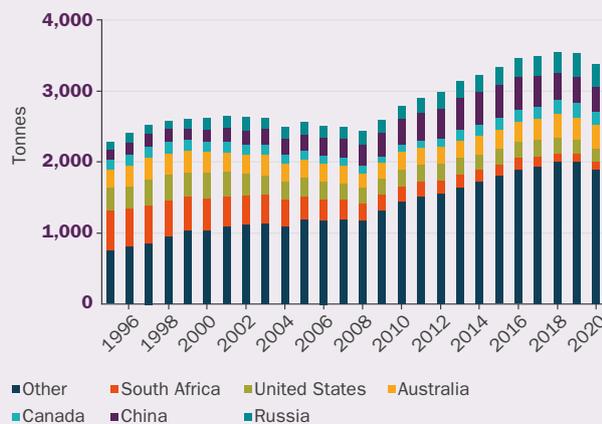
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However, in recent years, major gold producers have been and largely continue to be cautious about capital expenditure. Their focus remains centred on maximising value from their assets and increasing returns to shareholders. Looking at 12 of the biggest gold miners, we can see that their combined capital expenditure levels in 2019 were less than half of what they were in 2012, when these numbers peaked at \$35 billion. These levels are expected to remain relatively flat again in 2020, despite the dramatic gold price increase over the year, based on reported figures from Q1 to Q3. The capital and cost discipline employed by these companies has helped them strengthen their balance sheets and increase returns to shareholders. This approach looks set to remain in place moving forward, with investment in new projects limited to those that will maintain or improve profitability.

As a result, production growth will be constrained as the incentive from high prices to develop new projects and increase production will be offset to some extent by the business model in place at major producers.

GLOBAL GOLD PRODUCTION 1995-2020



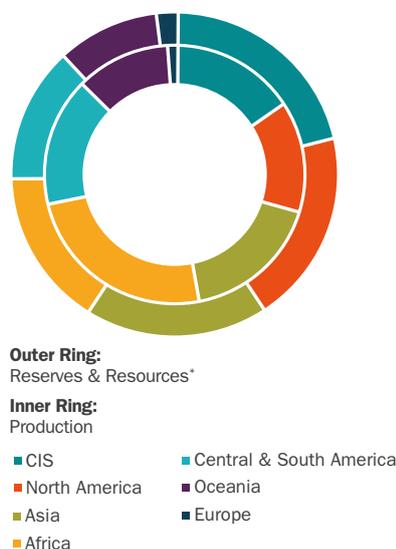
Source: Metals Focus, GFMS

### IN-GROUND RESERVES OF GOLD

At the end of 2019, in-ground gold mineral reserves totalled 55,460 tonnes of contained gold. Assuming an average recovery rate of 90%, this would be enough to sustain global production for 14 years at current rates. In addition to these reserves, there is also a further 183,240 tonnes of contained gold in resources. This would be sufficient to sustain production levels for a further 46 years. However, not all of this material will be successfully converted into reserves and ultimately extracted, as some of it will be deemed uneconomic to mine. Approximately 70% of these resources are found at operating mines. This portion is more likely to be converted to reserves and extracted.

**AT THE END OF 2019 IN-GROUND GOLD MINERAL RESERVES TOTALLED 55,460 TONNES OF CONTAINED GOLD**

GLOBAL RESOURCES VERSUS MINE PRODUCTION IN 2019



\*Reserves and resources are as at end-2019

Source: Metals Focus

ALL-IN SUSTAINING COST CURVE VERSUS GOLD PRICE



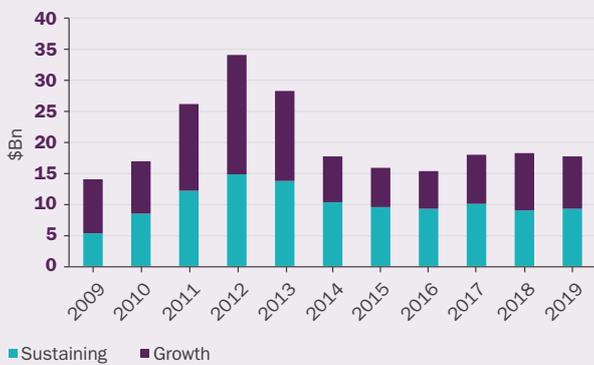
Source: Metals Focus Gold Mine Cost Service



Boddington Gold Mine, courtesy of Newmont Corporation.

**THE WORLD'S BIGGEST GOLD MINER, NEWMONT, TARGETED ACHIEVING NET-ZERO CARBON EMISSIONS BY 2050 LATE LAST YEAR AND OTHER MAJOR MINERS HAVE MADE SIMILAR COMMITMENTS.**

MAJOR GOLD PRODUCERS' CAPITAL EXPENDITURE 2009-2019



Companies included: Agnico Eagle, AngloGold Ashanti, Barrick Gold, Gold Fields, Goldcorp, Harmony, Kinross, Newcrest, Newmont Goldcorp, Polymetal, Randgold and Sibanye Stillwater.

Source: Metals Focus Peer Group Analysis

**CLIMATE CHANGE AND NET-ZERO**

The growing emphasis on ESG (environmental, social, corporate governance) for mining companies will continue moving forward, with a particular focus on greenhouse gas emissions.

Shareholders are increasingly demanding that miners take steps to curb emissions and most companies are now committing to doing this. The world's biggest gold miner, Newmont, targeted achieving net-zero carbon emissions by 2050 late last year and other major miners have made similar commitments.

To achieve these, companies will have to commit capital to initiatives such as developing renewable power generation, more efficient equipment and electrification of vehicle fleets. These initiatives will directly compete with project development and exploration for capital allocations, and the proportion of expenditure going in this direction will only increase moving forward. This will therefore reduce funds available for project development and exploration.

**EXPLORATION**

To sustain production levels in the long term will also require new deposits to be discovered via exploration. Looking at historic gold discoveries highlights some concerns in this area. 278 major gold deposits were discovered between 1990-2019 (S&P Global Market Intelligence - 2020). However, only 25 of these discoveries were made in the last decade and none between 2017 and 2019.

This lack of new discoveries is a result of exploration expenditure being focused on expanding previously found deposits rather than trying to discover new greenfield deposits.

This is reflective of the higher risks involved with greenfield exploration, with most companies preferring to spend money on expanding existing resources, which is inherently less risky.

This lack of new discoveries means that there are relatively few undeveloped high-quality gold deposits to replace major gold mines that will deplete their reserves over the next 25 years. This poses a problem for sustaining current production levels in the long term and has been an issue for a number of years already. For example, it was mentioned by Jamie Sokalsky, then CEO of Barrick Gold (see *Alchemist* 69, January 2013, 'International Mine Production').

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**UNDERGROUND MINING TO BECOME MORE PREVALENT**

Over the last 25 years, mined gold has been increasingly sourced from open-pit operations, while output from underground mines has declined. The main drivers of this change are declining production from South Africa, where output is almost exclusively from underground mines, the increased prevalence of heap leaching of low grade ore and the availability of bigger mining and processing equipment, allowing for economies of scale at open-pit operations. However, this trend has reversed in recent years, with the proportion of gold production coming from underground mines increasing from 33% in 2015 to 37% last year. This reversal is likely to continue moving forward for several reasons.

The average depth of gold deposits being discovered has been rising (MinEx Consulting – 2019), in turn, suggesting that a higher percentage of these will be better suited to underground, rather than open-pit, extraction.

Meanwhile, an increasing number of aging open pits will transition to underground mining in order to exploit deeper sections of their ore bodies.

In addition, technological improvements such as automation and remote operating will allow for more efficient and safer extraction from underground operations, which will reduce operating costs and improve the economics of underground mining. The smaller surface footprint of underground mines is also likely to be seen as increasingly beneficial from an ESG perspective when compared with open-pit mining. This could provide a headwind to production growth as underground mines often take longer to develop and ramp up to full production rates compared to open-pit operations.



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## THE NEXT 25 YEARS

So taking all this into account, what should we expect for gold production over the next 25 years?

Existing reserves are sufficient to maintain current production levels for 14 years.

This time period allows ample time for resources to be converted into reserves, in order to replace mined ounces, and also time for exploration to succeed in finding new deposits to sustain output in the longer term. However, to grow or even sustain current production levels over the next 25 years, companies will need to invest capital in existing mines, development projects and

greenfield exploration. The ability of companies to do this will largely be dictated by the gold price. If it remains high and margins are strong, miners will be able to divert a portion of their profits to developing their project pipelines, in order to sustain or grow production levels, and vice versa.

In addition to all this, technological advances will also influence gold production moving forward. Seafloor mining has been an area of discussion in recent years, with multiple organisations assessing its potential in producing several metals, including gold. However, it seems unlikely that this will become a significant source of gold production within the next 25 years, due to the availability of terrestrial sources and the technological, environmental and economic hurdles involved with seafloor mining.

A more meaningful impact will likely come from improvements to existing mining and processing methods utilising technology such as automation and artificial intelligence, which will be used to increase efficiencies.

As well as increasing production, new technology will also certainly be targeted at reducing emissions over the next 25 years to improve the environmental credentials of gold mining.

Our view is that gold prices will remain strong over the next two years, followed by a decline to 2025. The near-term high prices will incentivise greater investment in exploration and new projects; however, this will dissipate as prices decline in the longer term.

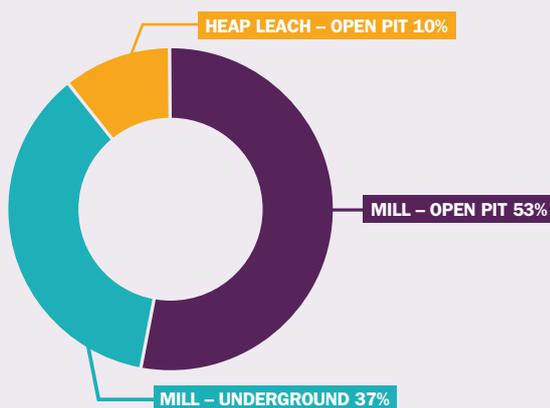
Meanwhile, we expect the majors will remain focused on maximising value from their assets and increasing returns to shareholders, alongside committing more capital expenditure to initiatives aimed at

## THESE FACTORS WILL LEAD TO RISING GLOBAL GOLD PRODUCTION OVER THE NEXT FEW YEARS

These factors will lead to rising global gold production over the next few years. However, in the longer term, a lack of investment in exploration and new projects, alongside an increased prevalence of long lead-time underground projects, will result in a flat to declining profile for global gold mine production. Although declines will be mitigated to some degree by increased efficiencies coming from new technologies.

reducing emissions. Capital expenditure for new projects will target a limited number of high-quality deposits that will maintain or increase profitability.

GOLD PRODUCTION BY MINE TYPE IN 2020\*



\*Excludes production from the ASM (Artisanal and Small-Scale Mining) sector

Source: Metals Focus

## WORKS CITED:

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 Unless cited otherwise, content is from Metals Focus



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Prior to joining Metals Focus he was Head of Mine Economics at S&P Global Market Intelligence where he lead research into supply and costs across 15 different commodities. Earlier in his career he worked as a geologist on mines sites and exploration properties in Western Australia. He has a BSc in Earth Science from the University of Wales Aberystwyth and an MSc in Geochemistry from the University of Leeds.