

# Long-term forecast of Australia's mineral production and revenue

## The outlook for gold: 2017-2057

Report by MinEx Consulting: October 2017

Under the combined support and sponsorship of six government agencies (both State and Federal), three research organisations and three industry groups<sup>1</sup>, **a landmark report has been published<sup>2</sup> by MinEx Consulting looking at the forty-year outlook for the Australian gold industry.** It forecasts the likely number of mines, production, revenues and employment out to 2057 for this vital sector of Australia's economy.

**In the past, most industry studies rarely look beyond ten years.** The report's author, Richard Schodde, says that *"there are two good reasons for this; Firstly; the future is highly uncertain – and any single-line forecast is almost certain to be wrong. Secondly; most of these studies only looked at existing mines and possible new projects. This is fine for short- to medium-term forecasts but it ignores the important contribution of new discoveries for mine production in the longer-term."*

**It goes without saying that every mine has a finite life (and will eventually close down); it also equally true that all mines were once a gleam in the eye of a geologist (i.e. it took someone to find them).** Leaving out the discovery story results in an incomplete view on the long-term future of the mining industry.

As discussed below, nurturing exploration success is critical for ensuring the long-term sustainability of the mining industry.

**MinEx Consulting's approach to the task was via the following eight-step process:**

1. Embracing uncertainty and using a Monte Carlo approach to assess 1000 different possible scenarios of the future. This included generating a series of commodity price cycles that reflect what the industry has experienced in the past.
2. Estimating future production from existing mines, adjusted for changes in the gold price, variability in operating performance and possible mine-life extensions.
3. Assessing whether the future gold price scenario is sufficiently high enough to trigger the development of new mines on known projects.
4. Using the price scenarios to predict likely future exploration expenditures. And from this,
5. Estimating the likely number, size and quality of discoveries made over time.
6. Determining the likelihood that a given discovery will be developed and, if so, incorporating a time-delay between discovery and development.
7. Developing a model to estimate the likely production rate and mine life for these discoveries. From this, estimating their likely timing and contribution to future revenues and employment.
8. Integrating together the results for existing mines, new projects and exploration success.

The study assumes that there is a 90% chance that over the next forty years the gold price will lie between \$793 and \$2258 per ounce, with an average price of \$1524 (in constant 2017 A\$). Today's price is ~A\$1650/oz.

The key results are summarised in two sets of charts.

- Figure 1 shows the "mean" (or average) forecast gold production over the next forty years for Australia, broken down by source (from existing mines, known new projects and exploration success).
- Figure 2 shows the trend (and degree of uncertainty) in the overall forecast number of mines, gold production, employment and revenues for the industry under different possible scenarios. Although there is a wide range of outcomes, the overall trends are clear.

Figure 1 shows that **over the short-term (i.e. the next 5 years) production is dominated by existing mines.** Output from these mines will remain steady for the next two years (with 9.7 Moz produced in 2017) then quickly

<sup>1</sup> See TABLE 1 for the full list of sponsors.

<sup>2</sup> A copy of the full report can be downloaded from <http://www.minexconsulting.com/publications.html>. Electronic copies will also be available on the sponsors' web-sites.

decline thereafter. In forty years-time only four of the current 71 mines will still be operating – with most closing down over the next two decades. This includes iconic mines like the Kalgoorlie Super Pit and Telfer. MinEx forecasts that, by 2057, the remaining mines will produce less than 0.4 Moz pa of gold.

**In the medium term (i.e. 5-10 years out) an increasing amount of production will be supplied from new mines based on known deposits.** However, it won't be enough to offset the decline from existing mines. By 2057, output from new projects will only total 0.3 Moz pa.

Many of these new projects are only economic under high gold price scenarios.

**In the long term (i.e. 10-40 years out) exploration success will play a major role in overcoming much of the looming shortfall in gold production.** The model forecasts that, over the longer term around \$677 million pa will be spent on gold exploration in Australia (slightly up on current levels), resulting in 266 new gold deposits being found over the next forty years. Half of these will be developed, and will contribute 4.06 Moz pa of gold in 2057. This is equal to 87% of the combined total production of 4.69 Moz pa in that year. **Consequently, in forty years-time almost all of Australia's future gold production will come from exploration successes.**

**It is significant to note that the model predicts that in 15 years-time (i.e. by 2032) half of Australia's gold production will come from mines that are yet to be discovered.**

**However, of serious concern is the fact that the weighted average delay between discovery and development for a new discovery is 13 years.** There are also indications that it is getting harder and slower to convert a discovery into a mine.

Consequently, government and industry need to support exploration today. **We only have the next couple of years to properly identify and address ways to improve our exploration performance - otherwise Australia runs the real risk of a significant supply disruption in the medium-term.**

Figure 2 shows that over the next forty years, gold production and revenues are set to drop by half – to 4.69 Moz and A\$7.3 billion respectively. The number of operating mines is set to fall by a third (from 71 to 47) and total employment by 70% (from 27,980 to 8,300 workers). Half of the fall in employment is associated with productivity gains associated with automation.

**Sensitivity studies indicate that each additional dollar spent on exploration generates an extra \$11.40 in revenue.**

MinEx estimates that **for the Australian gold industry to maintain production at current levels in the longer term, it will either need to double the amount spent on exploration or double its discovery performance** (i.e. reduce unit discovery costs from \$70/oz to \$35/oz). The incremental benefits of reaching this target will be an extra 4.05 Moz of annual production, an extra \$6.23 billion in revenues and additional 7160 jobs.

The above-mentioned outlook is premised on "business-as-usual". **The opportunity exists for industry and government to take the initiative to invent its own future.** In addition to developing policies that encourage/stimulate exploration, the opportunity also exists to be more efficient and effective at making discoveries. The challenge is that many of these initiatives require effort (and money) and will take several years to bear fruit.

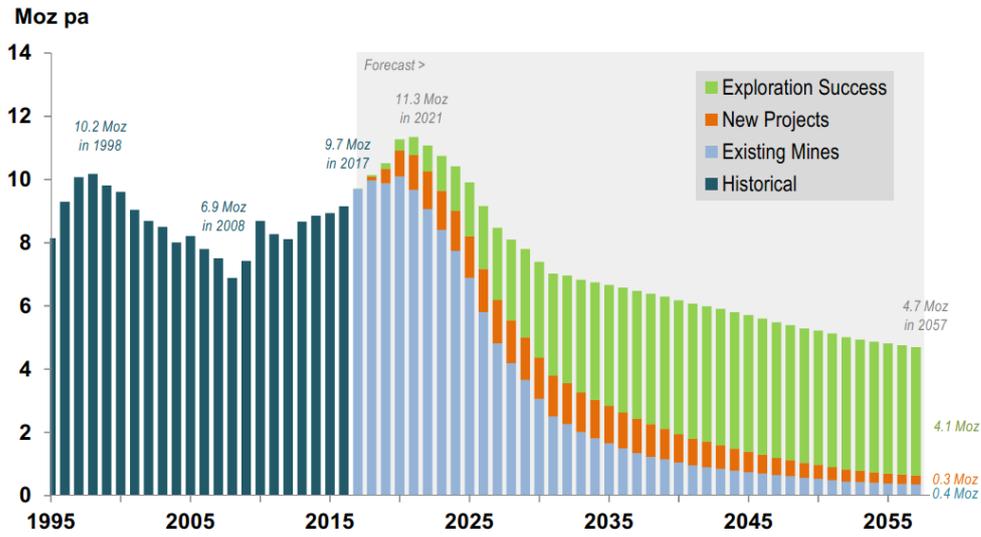
Given the long lead times involved (both for R&D, discovery and mine development) there is an urgent need to start the process now.

*The above report on the forty-year production outlook for Australia's gold industry is part of a larger study assessing the long-term outlook for Australia's minerals industry. This includes iron ore, coal, base metals and uranium. These reports will be progressively released over the next few months.*

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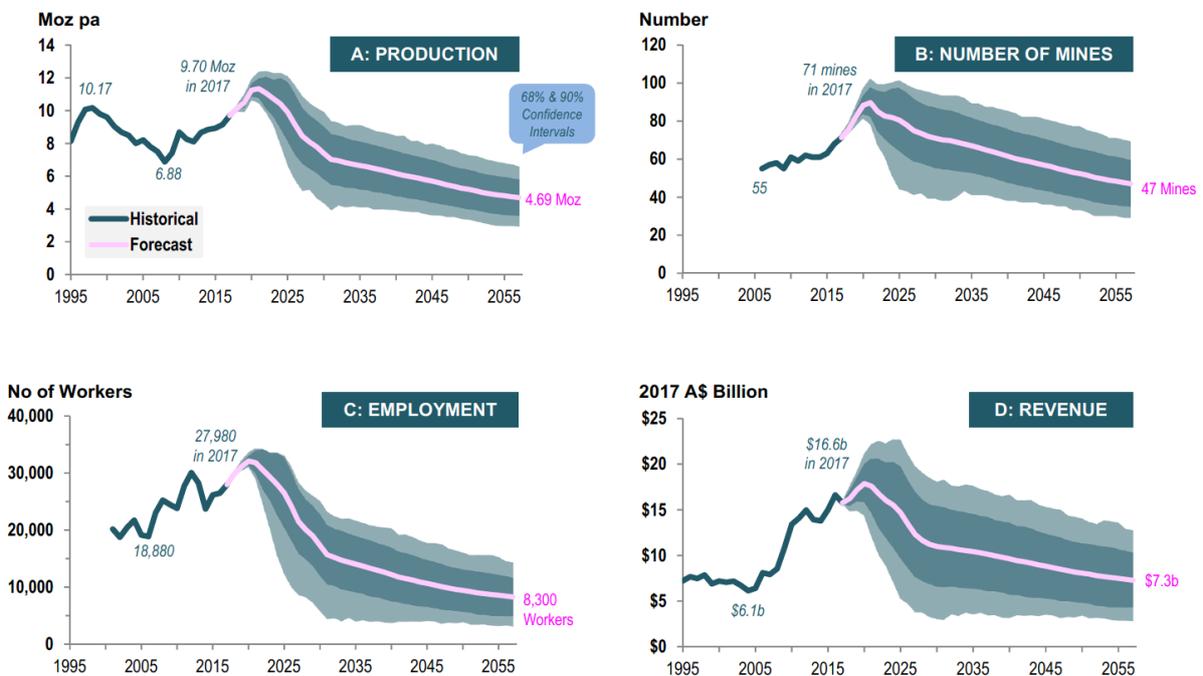
**Figure 1: Forecast total gold production for Australia: 1995-2057**  
**Base Case assumption: "Mean" results**



Note: Mean/Average forecast only. Due to uncertainty in commodity prices and exploration success the likely forecast figure (at a 90% Confidence Interval) will vary by +/-40%.

Source: MinEx Consulting © October 2017

**Figure 2: Forecast production, number of mines, employment and revenues for the Australian gold industry: 1995-2057**



Source: MinEx Consulting © October 2017

## TABLE 1: LIST OF SPONSORS FOR THE STUDY

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The 12 sponsors of the study are:

- Association of Mining and Exploration Companies (AMEC)
- Australian Institute of Geoscientists (AIG)
- Centre for Exploration Targeting (CET)
- Chamber of Minerals and Energy of Western Australia
- CSIRO
- Deep Exploration Technologies Cooperative Research Centre (DET CRC)
- Department of Industry, Innovation and Science
- Geoscience Australia
- Geological Survey of Western Australia Geoscience Australia (GSWA)
- Northern Territory Geological Survey (NTGS)
- NSW Department of Trade & Investment, and the
- South Australian Geological Survey

## BACKGROUND INFORMATION ON THE AUTHOR

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Richard Schodde has over 35 years of experience in a wide variety of project analysis, business development and strategic planning roles within the international resources industry – at WMC Resources and BHP Billiton.

In 2008 Richard founded MinEx Consulting to provide strategic and economic advice to industry and government. His main focus is on the economics of mineral exploration. His client base covers over 80 companies (both Major and Junior), investment groups and Government Agencies across twelve countries.

In 2009 he was appointed an Adjunct Professor to the Centre of Exploration Targeting at the University of Western Australia. **Richard has published several dozen papers on exploration performance and is internationally recognized by his peers as a world leader in mineral economics. For this reason, for the last two years running the Mining Journal nominated him as one of the top 20 most influential people in the mining industry.**