



**EARTH
RESOURCES
SECTOR
INDICATORS**
2018–2019

Image courtesy of Kirkland Lake Gold's
Fosterville Gold Mine

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MINISTER'S FOREWORD



Victoria's resources sector is booming.

Gold is being produced at a level not seen in over 100 years, while sand, stone and gravel are being delivered to support state infrastructure projects. The result is Victorian jobs – particularly in our regions.

To make the sector's contribution to regional communities and Victoria's economy more visible it's vital that we have access to the latest, most reliable statistical data.

This year's Earth Resources Sector Indicators report highlights several trends.

In 2018-19, gold production was up by about 55 per cent, exceeding a sales value of \$1 billion. During the same period minerals exploration expenditure, a measure of industry confidence, increased by 39 per cent to top \$100 million.

It's not surprising that employment in the sector is at its highest level in over a decade.

Two strategies are guiding the resources sector to improve community outcomes across the minerals and quarry sectors – *State of Discovery: Mineral Resources Strategy 2018–2023* and *Helping Victoria Grow: Extractive Resources Strategy*.

This report provides data making it possible to track the goals identified in these strategies.

Gas produced in Victorian coastal waters increased by 10.7 per cent in 2018-19, but production is expected to decline as offshore gas fields are depleted.

The Victorian Government has lifted the onshore conventional gas moratorium from 1 July 2021. Should viable quantities of gas be discovered, and regulatory approvals be obtained, development could start in 2023–24.

I'm proud that the **Victorian Government** continues to invest in programs across the Resources portfolio.

The job creation, investment attraction and economic growth made possible by the resources sector is a crucial part of our commitment to helping regional Victoria thrive.

I would like to thank everyone in the industry for a year of hard work and impressive growth. I look forward to highlighting the sector's continued growth in the future editions of this report.

Jaclyn Symes MP
Minister for Resources



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INTRODUCTION

Each year, the *Earth Resources Sector Indicators* report is produced to promote a shared understanding of the sector and enable effective earth resource decision-making.

This report includes mineral and extractive resource information for the 2018–19 financial year and builds on foundations laid by previous Earth Resources Sector Indicators reports.

Earth Resources Sector Indicators is intended to:

- establish a framework for collection and analysis of key information for the sector;
- provide a common and easily accessible set of metrics for stakeholder reference;
- complement existing earth resources reporting requirements; and
- highlight opportunities to develop additional sector indicators for future reports.

VICTORIAN GOVERNMENT POLICY

Gas

The government is committed to ensuring long-term, affordable gas supplies are available to Victorian homes and businesses.

- In June 2020, the Parliament passed the *Petroleum Legislation Amendment Act 2020* to allow for an orderly restart of conventional gas exploration and production from 1 July 2021 on terms that will enhance community confidence in the industry. The decision follows three years of detailed investigation by the Victorian Gas Program that found an onshore conventional gas industry would not compromise the state's environmental and agricultural credentials. The studies estimate that there could be between 128–830 petajoules of commercially feasible gas that is yet to be discovered. The restart of the industry has the potential to generate more than \$310 million annually for regional economies and create up to 6,400 jobs over the lifespan of these projects.
- To encourage further offshore gas exploration and development, government released five offshore acreage areas in the Otway Basin for tender in 2018, and released data from an airborne gravity survey of a large portion of the basin. In July 2020, the Minister for Resources announced that two exploration permits from this tender process were granted to Beach Energy and Bridgeport Energy. Should initial exploration be successful, up to \$85 million could flow into the economy, contributing to further investment in South-West Victoria and new jobs.
- All new gas from offshore waters under Victorian jurisdiction and onshore conventional gas development will be prioritised for domestic use, further strengthening Victoria's energy security and supporting local industry and consumers. Natural gas will continue to play an important role in supporting Victoria's transition to a cleaner energy future, in line with the government's commitment to net-zero emissions by 2050.
- The government is currently working with industry and communities to develop regulations to give effect to rigorous engagement and transparency obligations under the *Petroleum Amendment Act 2020*. Landholders will also be supported to better negotiate access rights and compensation with exploration companies. The new regulations will be ready for the restart of onshore conventional gas activity from 1 July 2021.
- Securing gas supply at reasonable prices for Victorians does not have to come at the cost of the state's prime agricultural resources and clean, green reputation. The Victorian Government introduced a bill in March 2020 to entrench a permanent ban on hydraulic fracturing (fracking) and exploration for mining of coal seam gas in the Victorian Constitution.

Minerals

The Victorian Government is progressing actions outlined in the *State of Discovery: Mineral Resources Strategy 2018-23* to help grow investment and jobs in Victoria's minerals sector:

- In October 2019, the Victorian Government announced a competitive tender for mineral exploration rights in the North Central Victorian Goldfields area, which is prospective for gold. The North Central Victorian Goldfields area neighbours the Fosterville Gold Mine near Bendigo, an internationally-renowned success story with some of the highest gold grades reported globally in recent years. This tender raises the bar significantly for engagement of Traditional Owners in mineral exploration, as well as engagement with landholders and local communities.
- In support of the broader Mining Equipment, Technology and Services (METS) sector the Department of Jobs, Precincts and Regions (DJPR) launched the METS Regional Innovation Accelerator Program in October 2019. The program is designed to help regionally based businesses to engage with local mining companies, fast-track product innovation and promote their services.
- DJPR is progressing work on the design of a Community Benefit Scheme, including preliminary consultation with regional stakeholders, industry, councils, and Traditional Owners.



Extractives

Victoria's Extractive Resources Strategy sets out the government's proactive plan to ensure that a reliable and affordable supply of extractive resources continues to be available to support Victoria's growth.

The Extractives Strategy Taskforce, which includes representatives from industry and across government, continues to monitor the extractive resources demand and supply situation closely.

Extractive resources and the quarrying sector are the foundation of our built environment, contributing to Victoria's economic development, liveability and community wellbeing:

- Many of Victoria's mines and quarries are in regional and peri-urban areas and can generate significant benefits for host communities and the broader region when planned for and operated responsibly. They are the backbone of many regional towns, providing employment and downstream economic benefits to those communities.
- The quarrying sector played a significant role in rebuilding infrastructure and communities impacted by bushfires over the 2019-20 bushfire season, particularly in Gippsland.
- The Victorian Government has implemented regulatory improvements to ensure that the approval of new and expanded quarries is accelerated, including providing guidance to help industry navigate approval processes.
- The Mineral Resources (Sustainable Development) (Extractive Industries) Regulations 2019 were remade and the updated regulations came into effect in January 2020. The remade regulations support the regulator and industry to better manage the risks associated with quarrying (including site rehabilitation) and introduced requirements to better capture data on reserve levels of sand and stone throughout Victoria. Government, community and industry all benefit from access to data to inform decision-making on infrastructure, transport, logistics, and construction. Victoria has already seen the benefits of this regulation change where six expanding quarries have had access to streamlined approval processes and have received planning permits – bringing over 60 million tonnes of additional resources to market over their lifetime.
- The Strategic Extractive Resource Area (SERA) Pilot Project is scheduled to be delivered in 2020. The SERA Pilot Project will trial the application of amended provisions in the planning scheme to better identify potential extractive resources and protect them from encroachment by incompatible land uses. The pilots are being conducted within the Wyndham and South Gippsland local government areas. DJPR is partnering with the Department of Environment, Land, Water and Planning to deliver this project, in collaboration with the two councils.

Carbon Capture and Storage

Following the release of the *Statement on Future Uses of Brown Coal*, the Victorian Government is continuing to investigate carbon abatement strategies including Carbon Capture and Storage (CCS):

- CarbonNet is advancing its work to test the viability of establishing a commercial-scale CCS network hub in Gippsland, using world class offshore storage sites in Bass Strait.
- CarbonNet is a critical enabler for the commercial stage of the Japanese led Hydrogen Energy Supply Chain (HESC) Project. The HESC Pilot Project is a world first looking to prove and commercialise a supply chain between Australia in the Latrobe Valley and Japan for hydrogen produced from brown coal.
- The HESC Pilot Project commenced operations for one year in 2020, with a view to a commercial project operating in the 2030s, based on the availability of a viable CCS solution.
- The HESC Pilot Project will see \$230 million expended in Victoria and will create approximately 400 jobs directly and in the supply chain.
- If proved viable, HESC and CarbonNet could present Victoria with an option to secure jobs, boost skills and attract investment in new industries, while strengthening Victoria's energy security and climate change leadership.
- The latter half of 2020 will see the Latrobe Valley trial facility commence production with the world's first shipment of liquified hydrogen scheduled to depart from Hastings in March 2021.



Mine Rehabilitation

The Latrobe Valley Regional Rehabilitation Strategy (LVRRS) was released in June 2020 and provides a blueprint to progress Latrobe Valley coal mine rehabilitation planning and activities to achieve safe, stable and sustainable landforms that support the next land use. The LVRRS builds on legislative reforms introduced in 2019 to strengthen rehabilitation planning requirements. The implementation of the LVRRS will provide mine licensees with further clarity on the options available for mine rehabilitation. This will include exploring the feasibility of alternative water sources and guidance on how to assess the future water availability from the Latrobe River system.

The Mine Land Rehabilitation Authority was established from 30 June 2020 to monitor the implementation of the LVRRS and provide assurance that government and industry is progressing mine rehabilitation planning.

The department is preparing to amend regulations to give effect to the legislative reforms introduced in 2019. The Declared Mine Regulations are due to be released for public consultation in early 2021.

Coronavirus (COVID-19) Victorian Government Responses

The focus of the Earth Resources Sector Indicators 2018-19 Report is on the 2018-19 financial year. The impacts of COVID-19 will be reflected in the following editions of the ERSI.

Mining is currently classed as an 'essential service' by national and state governments. While most operations were able to continue in 2020, COVID-19 has brought several challenges to the sector. As a result of the unprecedented impacts of COVID-19, the industry has faced logistical disruptions, restrictions on equipment and labour availability due to border closures and challenges to sourcing new capital.



To support Victoria's economic recovery, the Victorian Government is committed to supporting the earth resources sector during and after the COVID-19 pandemic, which is an important source of jobs and economic activity, especially for regional communities:

- Earth Resources Regulation deferred the collection of rent and annual fees this year to aid the immediate cashflow of mines, quarries and exploration companies. The collection of around \$3.5 million of revenue will be delayed by 6 months to January 2021.
- Mineral tenement holders were allowed to defer their annual technical reporting (required under legislation) as part of COVID-19 support.
- The government will streamline planning to help grow strategically important quarries and develop new sites, to aid the flow of raw materials over the coming years. Earth Resources Regulation already has a streamlined approval pathway for minor changes to existing quarries. It will now fast-track the approval process for works to supply critical material for infrastructure projects at a time when businesses are facing additional pressure. Continued supply of extractive materials is vital to support the Victorian Government's construction-led economic recovery from COVID-19 including the \$2.7 billion Building Works package and other major infrastructure programs.
- The government is working with industry to position operators and employees to rebound post-pandemic, including by progressing the North Central Victorian Goldfields Ground Release tender and Victoria's petroleum acreage release.
- The department will continue to consult with key stakeholders to understand the ongoing impacts of COVID-19 and how government can continue to support the resources sector in this context.
- The government continues to work closely with state and federal counterparts to manage cross-border issues and ensure a well-informed and coordinated approach to the COVID-19 response.
- Resources has the green light, with all mining operations across regional Victoria and metropolitan Melbourne able to continue operating under COVIDSafe Plans from 14 September 2020, across the duration of the roadmap. This will assist the sector to continue the positive momentum it has gained this year.
- The Victorian Government announced three rounds of the Business Support Fund totalling \$6 billion. This fund has supported a variety of resources business through grants, payroll tax refunds and waivers to enable businesses cashflow support. This funding also provides additional funding, tools and resources to help businesses adapt and prepare for reopening under COVID normal settings.
- \$1.1 million in funding for the Earth Resources Regulator to deal with the surge in mineral applications.
- The Victorian Government will deliver the *Victorian Budget 2020/21* on 24 November. The Budget will continue vital support for Victorian families, businesses and jobs, and kickstart an unprecedented investment in infrastructure and services our state will need for decades to come. This will build on the billions of dollars in support and stimulus the Government has already announced – delivering jobs for Victorians and helping repair the damage this once-in-a-generation pandemic has wrought.





MINERAL EXPLORATION ACTIVITY

Metres drilled: 348,192
Exploration expenditure: \$102.3m

Mineral exploration activity in Victoria continued to build on the previous year’s growth in 2018-19:

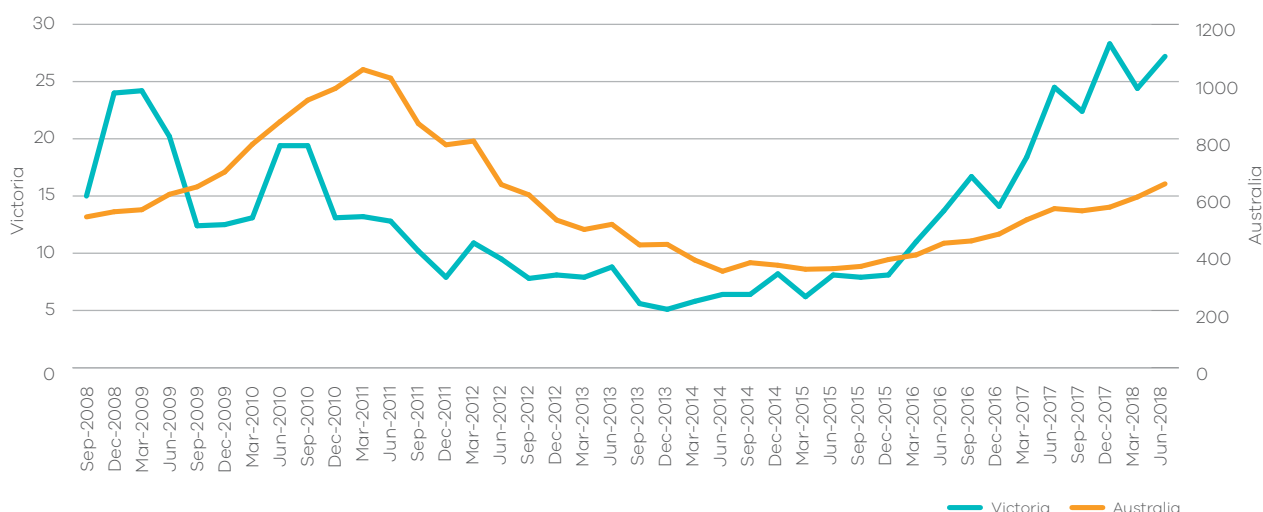
- Metres drilled increased significantly by 82 per cent from 191,229 metres drilled in 2017-18 up to 348,192 metres drilled in 2018-19.¹
- Mineral exploration expenditure increased by 39 per cent from \$73.7 million in 2017-18 up to \$102.3 million in 2018-19.²

These results are the highest ever recorded for the state’s mineral resources.³ 2018-19 saw exploration significantly increase in both new prospects and existing deposits. The resurgence of the state’s gold sector has been a primary driver of the increase in exploration investment observed over the past few years.

New investment has also flowed from the government’s release of land for mineral exploration in the Stavely Arc.

Victoria’s strong and sustained annual growth in mineral exploration expenditure over the past five years demonstrates the confidence that industry and investors have in the state’s mineral prospectivity. The average annual mineral exploration growth rate since 2015 in Victoria has outpaced the national average more than fourfold— the average annual Victorian mineral exploration expenditure growth since 2015-16 is 47 per cent, compared with 11 per cent average annual growth for the nation. Victoria’s share of Australia’s total mineral exploration expenditure has increased year on year since 2014-15, reaching 4.36 per cent in 2018-19.⁴

Figure 1: Mineral exploration expenditure (\$ million, seasonally adjusted)⁵



Note: Earth Resources Sector Indicators only include information on mineral exploration expenditure. Petroleum exploration data for Victoria is not reported for confidentiality reasons.

1 Geological Survey of Victoria. – Unpublished data.
 2 ABS, 8412.0, Mineral and Petroleum Exploration, released 02/06/2020.
 3 The Australian Bureau of Statistics has been recording mineral exploration expenditure in Victorian since 1988-89.
 4 ABS, 8412.0, Mineral and Petroleum Exploration, released 02/06/2020.
 5 ABS, 8412.0, Mineral and Petroleum Exploration, released 02/06/2020.





LICENCES

New mineral licences granted: 52

Renewed mineral licences: 41

(Mineral licences refers to the four mineral licence types: exploration, retention, mining and prospecting)

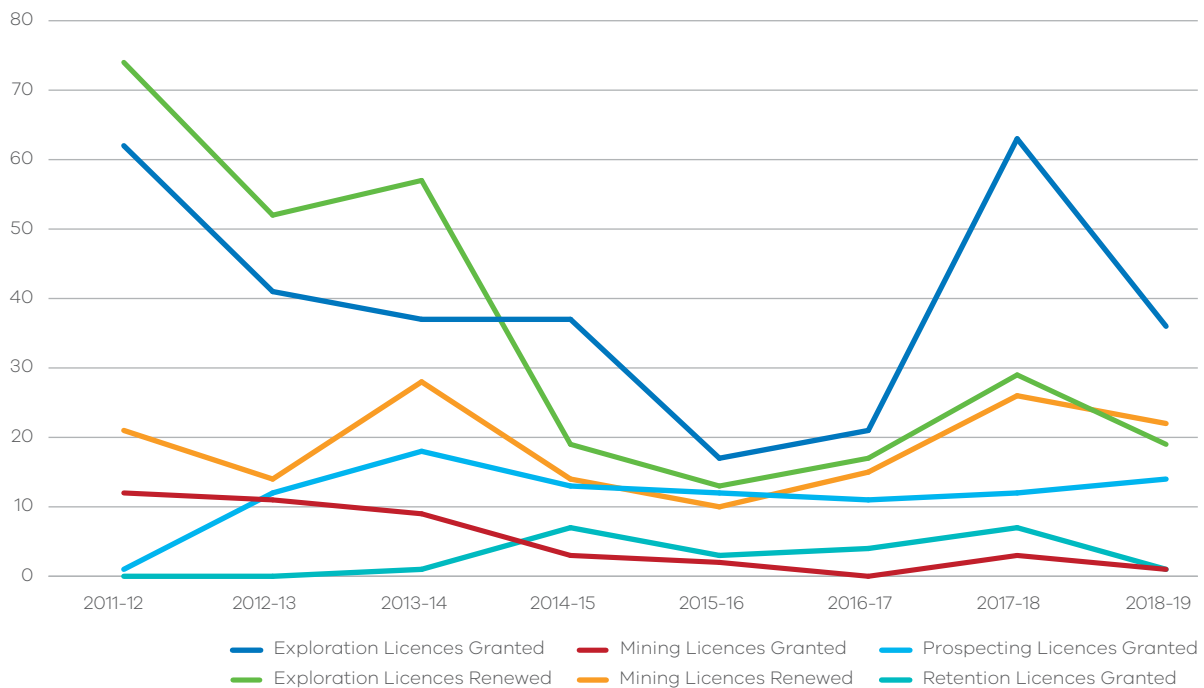
Mineral licences granted and renewed decreased in 2018-19:

- New mineral licences granted decreased by 39 per cent – 85 new licences in 2017-18 down to 52 in 2018-19.
- Renewed mineral licences decreased by 25 per cent – 55 renewed licences in 2017-18 down to 41 in 2018-19.

While the total number of licences granted or renewed during 2018-19 generally decreased with respect to 2017-18 levels, the number of mineral exploration licences held (212 licences, see Table 1) was the highest level in five years. Other licence categories have remained steady over the last few financial years.

The number of mineral licences either granted or renewed each year provides a reliable lead indicator of potential future mineral sector activity. Increases in exploration licence applications granted and renewed over the past two years have coincided with an unprecedented level of mineral exploration investment in Victoria over the 2018-19 period.

Figure 2: Licences granted or renewed for 2018-19⁶



6 Earth Resources Regulation, 2018-19 Annual Statistical Report, p. 14.

Table 1: Current Mineral Licences as at 30 June 2019⁷

| Tenement Type | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 |
|--------------------------------|------------|------------|------------|------------|------------|------------|------------|
| Exploration Licences | 311 | 271 | 247 | 211 | 180 | 200 | 212 |
| Mining Licences | 212 | 191 | 171 | 170 | 162 | 156 | 145 |
| Prospecting Licences | 13 | 31 | 41 | 51 | 54 | 59 | 55 |
| Retention Licences | 1 | 1 | 8 | 11 | 15 | 20 | 21 |
| Totals | 537 | 494 | 467 | 443 | 411 | 435 | 433 |
| Change year-on-year (%) | +0.4 | -8.0 | -5.5 | -5.1 | -7.2 | +5.8 | -0.5 |

⁷ Earth Resources Regulation, 2018-19 Annual Statistical Report, p. 13.



MINER’S RIGHTS

Number of miner’s rights: 8512

The number of miner’s rights in Victoria increased year-on-year in 2018–19:

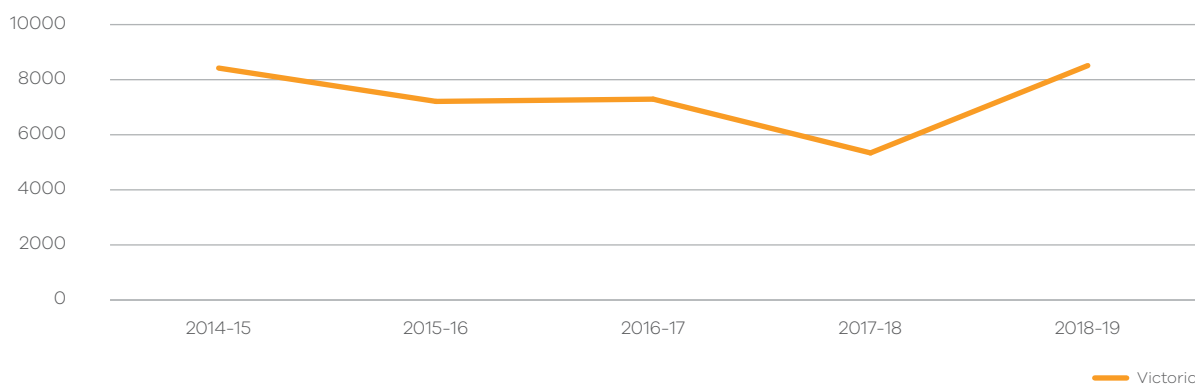
- Miner’s rights increased by 12 per cent – 7,600 in 2017–18 up to 8,512 in 2018–19.

Miner’s rights enable recreational prospectors to search for minerals on Crown land or private land where the activity is allowed.

Recreational prospecting is often conducted on public land and has health and wellbeing benefits for participants. According to the Victorian Environmental Assessment Council recreational prospectors contribute to local economies in terms of spending on consumables and accommodation, in prospecting supply shops and through participation on prospecting tours.⁸

Figure 3 illustrates that 2018-19 saw a reversal of the downward trend in miner’s rights issued each year, mainly attributed to an increase in interest driven by successes in recreational prospecting in the Victorian Goldfields. The government introduced ten-year duration miner’s rights in 2014.⁹ Due to this change, the frequency that recreational prospectors need to apply for licences has reduced and this is reflected in lower annual sales of miner’s rights until 2017-18.

Figure 3: Number of miner’s rights¹⁰



NB: These figures that are published in each Earth Resources Sector Indicators edition will differ from year to year. On average 80 per cent of miner's rights are sold "online" and the remainder 20 per cent are sold through "agent sales". Agent Sales are not entered in the database until Earth Resources Regulator receives payment from the agent. This lag results in some discrepancy in the figures for the year as a miner’s right may have been sold by an agent in one year but credited in the following year.

8 Victorian Environmental Assessment Council, Investigation into additional prospecting areas in parks, June 2013.
 9 Prior to 2014, miner’s rights were limited to two years.
 10 Earth Resources Regulation, unpublished data.



CAPITAL EXPENDITURE

New capital expenditure: \$652m

Earth resources sector capital expenditure in Victoria increased year-on-year in 2018-19:

- Private new capital expenditure in the Victorian earth resources sector increased by 39.3 per cent – \$468 million in 2017-18 up to \$652 million in 2018-19.

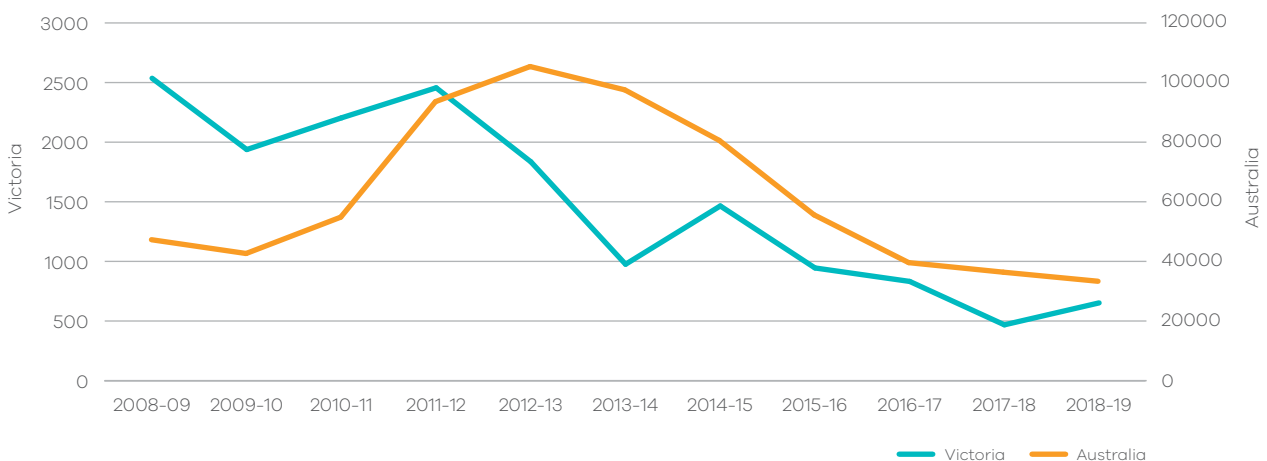
Private new capital expenditure in Victoria’s resource sector recovered by 39.3 per cent in 2018-19, whereas national capital expenditure declined by 8.3 per cent in 2018-19 (see Figure 4).

The increase in capital expenditure in Victoria can be attributed to mineral exploration success and the surge in interest in the minerals industry, more specifically gold and the increase in production at Fosterville, the re-opening of the Stawell mine and investment at Costerfield, Ballarat and Morning Star mines.

The extractives sector has also contributed to the overall increase in capital expenditure for Victoria. Quarries have played a crucial role in driving the government’s ‘Big Build’ in major road and rail projects. Extractive resources have been important in meeting population growth requirements over the 2018-19 period, the residential building industry has seen an increase in the value of work done by 8.2 per cent year-on-year in 2018-19.¹¹ Likewise, the value of work done for the non-residential industry increased by 9.8 per cent year-on-year in 2018-19.¹²

The Resources and Energy Quarterly June 2020 reported that expenditure across the mining sector nationally was driven by higher investment in machinery and equipment and higher commodity prices over 2019 and 2020.¹³

Figure 4: Private New capital expenditure (\$ million)¹⁴



11 ABS, 8752.0, Building Activity, released 15/07/2020.

12 ABS, 8752.0, Building Activity, released 15/07/2020.

13 Office of the Chief Economist, *Resources and Energy Quarterly*, June 2020.

14 ABS, 5625.0, Private New Capital Expenditure and Expected Expenditure, released 28/05/2020.

Note: Private New Capital Expenditure and Expected Expenditure (5625.0) reports on mining in its entirety, therefore the data is inclusive of exploration expenditure.



PRODUCTION

Quantity: Minerals (Due to different units of measurement per commodity, no total is included here) – (Table 2), Extractives – 62.7 million tonnes (Table 5)

Sales value: Total – \$2820.6 million¹⁵, Minerals – \$1046.9 million (Table 3), Extractives – \$1021.4 million (Table 5)

Victoria has a less diverse resource endowment and production of minerals compared to other Australian jurisdictions.

Table 2: Mineral production¹⁶

| Commodity | Unit | 2017–18 | 2018–19 | Change (%) |
|--------------------|-------------------|---------|---------|------------|
| Brown coal | Tonnes (thousand) | 45,062 | 42,256 | -6.2 |
| Gold | Ounce | 364,225 | 567,501 | +55.8 |
| Antimony* | Tonnes | 2,570 | 2,016 | -21.6 |
| Zircon** | Tonnes | 27,515 | 0 | -100.0 |
| Rutile** | Tonnes | 48,381 | 0 | -100.0 |
| Ilmenite** | Tonnes | 24,390 | 0 | -100.0 |
| Gypsum | Cubic metres | 395,707 | 291,842 | -27.0 |
| Kaolin & fine clay | Tonnes | 171,932 | 114,050 | -33.7 |

* Antimony is only mined at Costerfield in Victoria. Reduced production can be attributed to associated development works to access the Youle deposit.

** For 2018-19 no production occurred for these minerals. Most mineral sand resources (WIM deposits in north-western Victoria and deposits in Gippsland) are at pre-feasibility stage. 15 of the 21 Retention licences in Victoria are for mineral sands projects.

¹⁵ Total excludes the value of gas production due to commercial sensitivity.

¹⁶ Earth Resources Regulation, 2018-19 Annual Statistical Report, p. 11.

Table 3: Mineral production sales values (\$ million)¹⁷

| Commodity | 2017–18 | 2018–19 | Change (%) |
|---|--------------|----------------|--------------|
| Gold | 613.3 | 1,015.5 | +65.5 |
| Antimony | 28.2 | 21.2 | -24.8 |
| Heavy Minerals (incl. zircon, rutile, ilmenite) | 172.6 | 0.0 | -100.0 |
| Industrial Minerals (incl. gypsum, kaolin and fine clay) | 11.6 | 10.2 | -12.8 |
| Other Minerals (incl. silver, peat and quartz) | 0.2 | 0.04 | -80.0 |
| Total (excl. brown coal) | 825.9 | 1,046.9 | +26.7 |

¹⁷ Earth Resources Regulation, 2018-19 Annual Statistical Report, p. 11 NB: No unit value is assigned to brown coal for the purposes of determining its production value. Brown coal is almost entirely used for electricity production and is largely an internal transfer within mining/generation entities. As such, there is no available market price for brown coal.



GOLD

Victorian gold production: 567,501 ounces

Gold production in Victoria significantly increased year-on-year in 2018-19:

- Gold production increased by 56 per cent – 364,294 ounces in 2017–18 increasing to 567,501 in 2018-19.
- Sales value of gold produced increased by 66 per cent – \$614 million in 2017-18 to over \$1 billion in 2018-19.

Much of Victoria's early economic development stemmed from the discovery of gold in the 1850s. 170 years later, the state's gold sector is undergoing a renaissance. The implementation of the gold royalty on 1 January 2020, brings the state's gold producers in line with other minerals as well as resources operators in other Australian jurisdictions, ensuring all Victorians will benefit from the development of the state's gold resources.

Victoria has produced more than 1.5 per cent of historical world gold production from only 0.15 per cent of global land mass.¹⁸ Victoria's central goldfield geology is 100 times richer in gold than the global average¹⁹, and it is estimated that approximately 75 million ounces of gold may yet to be found in Northern Victoria, which is almost the same as the total gold produced in Victoria to date.²⁰

Gold is forecasted to continue performing well over the next few years, with gold prices and demand projected to remain strong, prices are expected to rise in 2020, then ease back in 2021-22.²¹

In 2018-19 the increase in gold production in Victoria is attributed to the recent discovery and development of high grades at the Fosterville operation. Fosterville is a world class, high-grade, low cost underground gold mine.²² It is Victoria's largest gold mine and currently the third largest gold producer in Australia. The 2019 calendar year²³ saw Fosterville produce 619,366 ounces of gold up from 356,230 ounces, beating the mine's 2019 guidance of 570,000 – 610,000 ounces²⁴. In 2019, Fosterville reported a 60 per cent increase in gold reserves,²⁵ indicating that strong production opportunities may lay ahead for that operation and gold prospects and deposits in similar Victorian geology.

There is potential for gold production to remain strong in the near future with unprecedented levels of mineral exploration investment in 2018-19, including on mining licences at Fosterville, Costerfield, Ballarat East and the recently reopened Stawell mine.²⁶ 2018 saw the Government support this momentum by extending mining licences at Fosterville and Stawell gold mines to 2035.

18 Earth Resources Victoria, Australia Minerals Technical Session - earthresources.vic.gov.au/_data/assets/pdf_file/0004/457231/PDAC-2019-Australia-Minerals-Technical-Session-Victoria.pdf.

19 Earth Resources Victoria, Australia Minerals Technical Session - earthresources.vic.gov.au/_data/assets/pdf_file/0004/457231/PDAC-2019-Australia-Minerals-Technical-Session-Victoria.pdf .

20 Willman C.E. 2010, Summary of geological findings Exploring for buried gold in northern Victoria, Gold Undercover Report 24, Geological Survey of Victoria.

21 Office of the Chief Economist, Resources and Energy Quarterly, June 2020.

22 Kirkland Lake Gold, Fosterville Mine Information - kl.gold/our-business/australia/fosterville-mine/default.aspx.

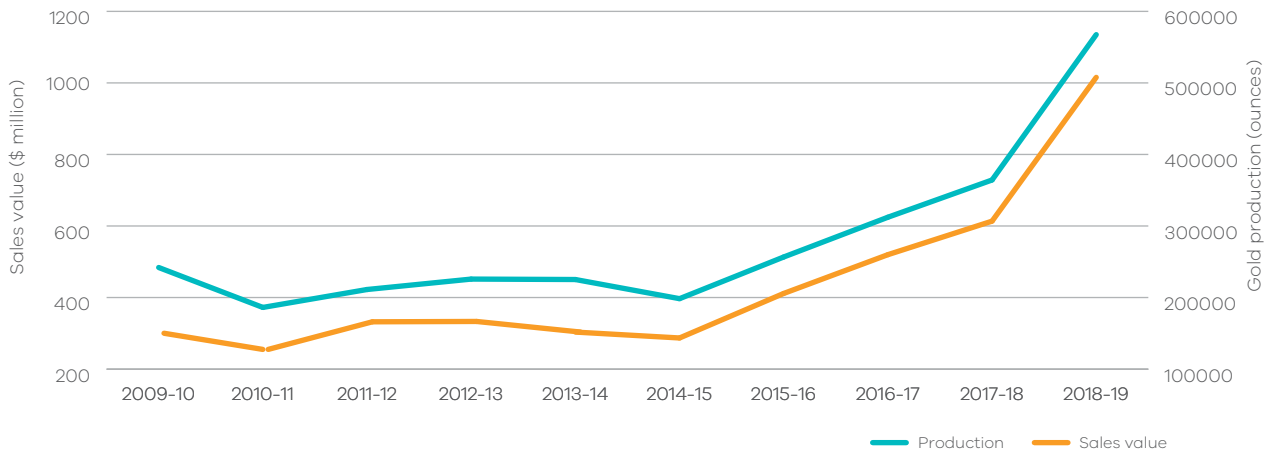
23 Kirkland Lake Gold are a Canadian Company that reports in line with the calendar year.

24 GlobalNewswire, Kirkland Lake Gold, Fosterville Mine – Production Guidance 2019 globenewswire.com/news-release/2019/02/21/1739314/0/en/Kirkland-Lake-Gold-Increases-2019-Production-Guidance-to-920-000-1-000-000-Ounces-Fosterville-Mineral-Reserves-Increase-60-to-2-7-Million-Ounces-at-31-0-g-t.html.

25 GlobalNewswire, Kirkland Lake Gold, Fosterville Mine – Production Guidance 2019 globenewswire.com/news-release/2019/02/21/1739314/0/en/Kirkland-Lake-Gold-Increases-2019-Production-Guidance-to-920-000-1-000-000-Ounces-Fosterville-Mineral-Reserves-Increase-60-to-2-7-Million-Ounces-at-31-0-g-t.html.

26 Geological Survey of Australia.

Figure 5: Gold production and sales values²⁷



27 Earth Resources Regulation, Annual Statistical Reports, 2009-2019.



GAS

Gas production: 15.4 petajoules

All gas consumed in Victoria is produced from gas fields offshore in state and Commonwealth waters.

Onshore unconventional gas development (hydraulic fracturing and coal seam gas) is banned permanently in Victoria. There is a legislated moratorium on onshore conventional gas development until 30 June 2021 while the government prepares for the orderly restart of the industry.

Gas produced in Victorian jurisdiction coastal waters increased year-on-year in 2018-19:

- Gas production increased 10.7 per cent – 13.9 petajoules in 2017-18 up to 15.4 petajoules in 2018-19.
- Victorian demand for gas was 220 petajoules in 2018.

Currently, all Victorian jurisdiction gas production occurs at the Halladale and Speculant Project in the south-west of the state. Gas produced from gas fields in Commonwealth waters off the coast of Victoria is processed in Gippsland and south western Victoria.

In 2020, the Victorian Parliament passed legislation to lift the moratorium on onshore conventional gas exploration and production from 1 July 2021. The Victorian Gas Program identified prospective onshore conventional gas reserves of between 128–830 petajoules (PJ). Development could potentially start from 2023–24 if industry makes a gas discovery, considers it commercially feasible to develop and secures the necessary regulatory approvals.²⁸

Under the Victorian Gas Program, in 2018 the government invited applications for five offshore areas in the Otway Basin totalling 1,318 square kilometres to secure future gas supplies. In July 2020, the Victorian Government announced that two exploration permits from this tender process had been granted. The Victorian Government will require any future production from these areas to be offered to domestic consumers first.

Although gas production increased in Victoria, gas producers in offshore Victoria forecast declining production as offshore gas fields are depleted. This will result in a supply gap not meeting the forecast peak winter period from 2023/2024 leading to an increase in dependence on gas storage and gas imports into Victoria²⁹. Long-term gas supply from 2021-2031 remains uncertain,³⁰ further exploration and development is required within Victorian jurisdiction of gas production to ensure gas supply will meet future demand.³¹

28 Victorian Gas Program, Progress Report No 4, March 2020.

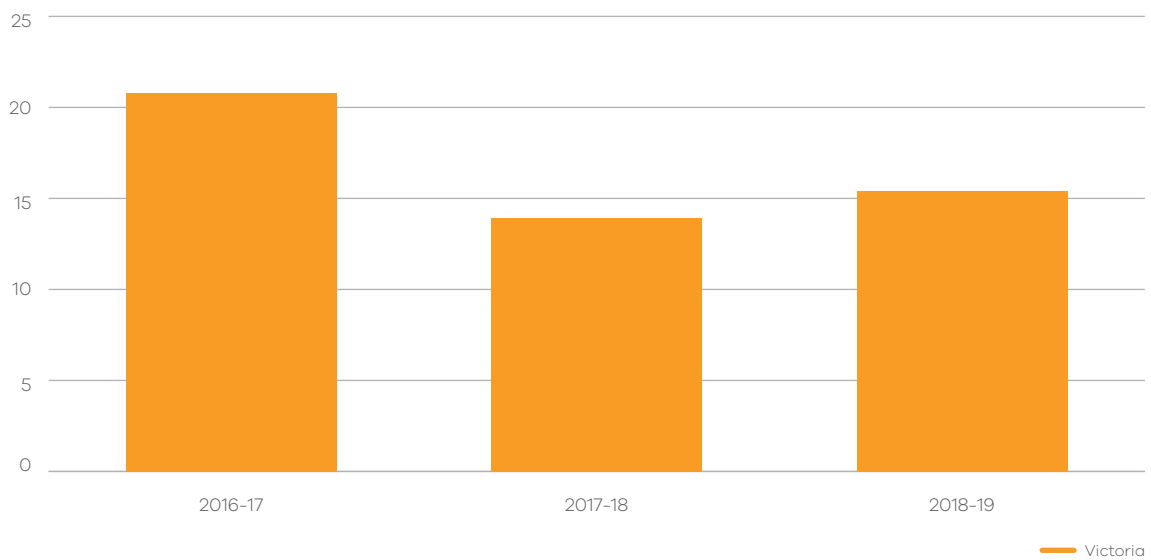
29 AEMO Victorian Gas Planning Report Update, March 2020 p.7.

30 ACCC, Gas Inquiry 2017-2025.

31 AEMO, Gas Statement of Opportunities, March 2020.

Table 4: Gas production³²

| Commodity | Unit | 2017-18 | 2018-19 | Change (%) |
|-----------|------------------|---------|---------|------------|
| Gas | Petajoules (PJe) | 13.9 | 15.4 | +10.7 |

Figure 6: Gas production (petajoules)³³

³² Earth Resources Regulation, 2018-19 Annual Statistical Report, p. 16.

³³ Earth Resources Regulation, 2016-17 to 2018-19 Annual Statistical Reports.



EXTRACTIVES

Production sales volume: 62.7 million tonnes
Production value: \$1.021 billion

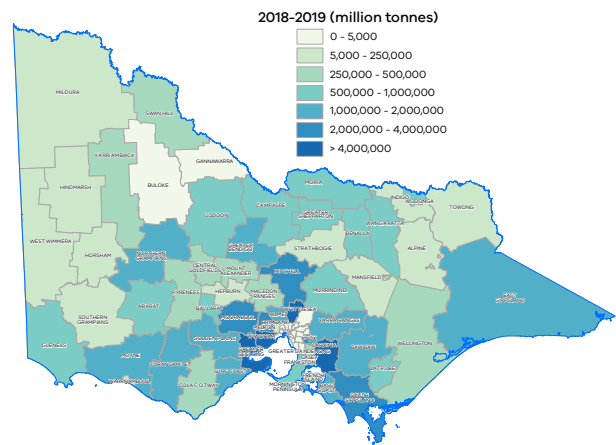
Extractive industries production volume and value both increased year-on-year in 2018-19:

- Extractives production volume increased by 8.4 per cent – 57.9 million tonnes in 2017-18 up to 62.7 million tonnes in 2018-19³⁴.
- Extractives sales value increased by 7.8 per cent – \$947.8 million in 2017-18 up to \$1.021 billion in 2018-19³⁵.
- The number of new extractive industry work authorities granted remained relatively steady from 13 in 2017-18 to 11 in 2018-19.³⁶

These statistics reflects an increasing demand for extractive resources driven by population growth and the Victorian Government’s Big Build.

Recent regulatory improvements have contributed to an acceleration of approvals of new and expanded quarries to meet higher than expected demand. These improvements also provide guidance and other support to help industry navigate complex approval processes.

Figure 7: Annual Production (Reported Production Sales Volume by Local Government Area)³⁷



34 Earth Resources Regulation, 2018-19 Annual Statistical Report, p.5.
 35 Earth Resources Regulation, 2018-19 Annual Statistical Report, p.5.
 36 Earth Resources Regulation, 2018-19 Annual Statistical Report, p.7.
 37 DJPR.

Table 5: Extractives volume and value of production³⁸

| Product Group | Product Type | 2017–18 Sales Volume (thousand tonnes) | 2018–19 Sales Volume (thousand tonnes) | Change (%) | 2017–18 Sales Value (\$ million) | 2018–19 Sales Value (\$ million) | Change (%) |
|--------------------|-------------------|---|---|-------------|-------------------------------------|-------------------------------------|-------------|
| Hard Rock | Basalt | 23,021 | 25,460 | +10.6 | 377.0 | 435.2 | +15.4 |
| | Gneiss | 5 | 10 | +100.0 | 0.0 | 0.0 | 0.0 |
| | Granite | 5,347 | 5,350 | +0.1 | 122.9 | 117.7 | -4.2 |
| | Hornfels | 4,462 | 5,220 | +17.0 | 75.1 | 86.7 | +15.5 |
| | Quartzite | 30 | 30 | 0.0 | 0.4 | 0.8 | +108.3 |
| | Rhyodacite | 1,779 | 1,510 | -15.1 | 43.6 | 33.5 | -23.2 |
| | Schist | 273 | 480 | +75.8 | 5.9 | 9.3 | +58.9 |
| | Slate | 43 | 40 | -7.0 | 0.7 | 1.2 | +77.3 |
| | Trachyte | 38 | 30 | -21.1 | 0.8 | 0.7 | -12.5 |
| Sub-total | | 34,998 | 38,130 | +8.9 | 626.2 | 685.0 | +9.4 |
| Soft Rock | Clay & clay shale | 1,475 | 1,200 | -18.6 | 3.9 | 3.5 | -9.0 |
| | Limestone | 1,424 | 1,980 | +39.0 | 26.2 | 28.9 | +10.3 |
| | Sand & gravel | 15,503 | 16,520 | +6.6 | 236.5 | 247.2 | +4.5 |
| | Scoria | 1,128 | 760 | -32.6 | 18.0 | 13.0 | -27.8 |
| | Sedimentary | 2,755 | 3,750 | +36.1 | 32.0 | 39.7 | +24.0 |
| | Soil | 24 | 50 | +108.3 | 0.3 | 0.6 | +138.5 |
| | Tuff | 562 | 320 | -43.1 | 4.7 | 3.5 | -25.8 |
| Sub-total | | 22,871 | 24,580 | +7.5 | 321.5 | 336.4 | +4.6 |
| GRAND TOTAL | | 57,869 | 62,710 | +8.4 | 947.8 | 1,021.4 | +7.8 |

Note: Because of rounding, numbers may not add.



EXTRACTIVES: DEMAND & SUPPLY

Demand: Value of building work done – \$38.8b

Supply: 62.7 million tonnes

Prior to COVID-19, Victoria was growing rapidly with population growth estimated to reach 11.2 million people by 2056.³⁹ This growth will require roughly 2.2 million homes and upgrades to community infrastructure. An average of eight tonnes of stone, gravel and sand per person is needed each year to build the houses and other infrastructure required by Victorians. This rapid rate of growth has contributed to unprecedented demand for building work and extractive materials. In 2018–19, the value of building work undertaken in Victoria was \$38.8 billion,⁴⁰ a 5.7 per cent year-on-year increase.

In 2018, DJPR in consultation with the Extractives Strategy Taskforce undertook an interim update of demand and supply for extractive resources in Victoria, confirming that demand is tracking around 20 per cent higher than the previous baseline forecast.⁴¹ This can be attributed to Victoria's sustained population growth and extensive infrastructure program such as the unprecedented public infrastructure investment of over \$100 billion over the next ten years across the state to cater for this growth. In 2018, the demand for extractive resources was concentrated in central and fringe areas of Metropolitan Melbourne. Key areas include Melbourne, Hume, Casey, Melton and Wyndham. In 2018 it was concluded that should this high demand trend continue, total annual production could reach 67 million tonnes by 2026 and over 100 million tonnes by 2050.⁴²

The 2018–19 demand and supply update highlighted that while there are sufficient reserves of extractive resources (hard rock, sand and gravel) available to meet expected demand in the short term, the supply of sand and gravel is lower than previously forecast, particularly in the Melbourne supply area. A comprehensive demand and supply analysis will be undertaken drawing on 2020–21 data and is expected to be published on the department's website in 2022.

In 2020, the COVID-19 pandemic has led to a slowdown in the arrival of new migrants and lower net migration, which will mean lower than previously forecast population growth in the short term. This will likely affect residential construction in particular. To monitor the impact of the COVID-19 pandemic during 2020, an update of demand for resources will be undertaken in late 2020, taking into account updated population forecasts, quarry production and construction data.

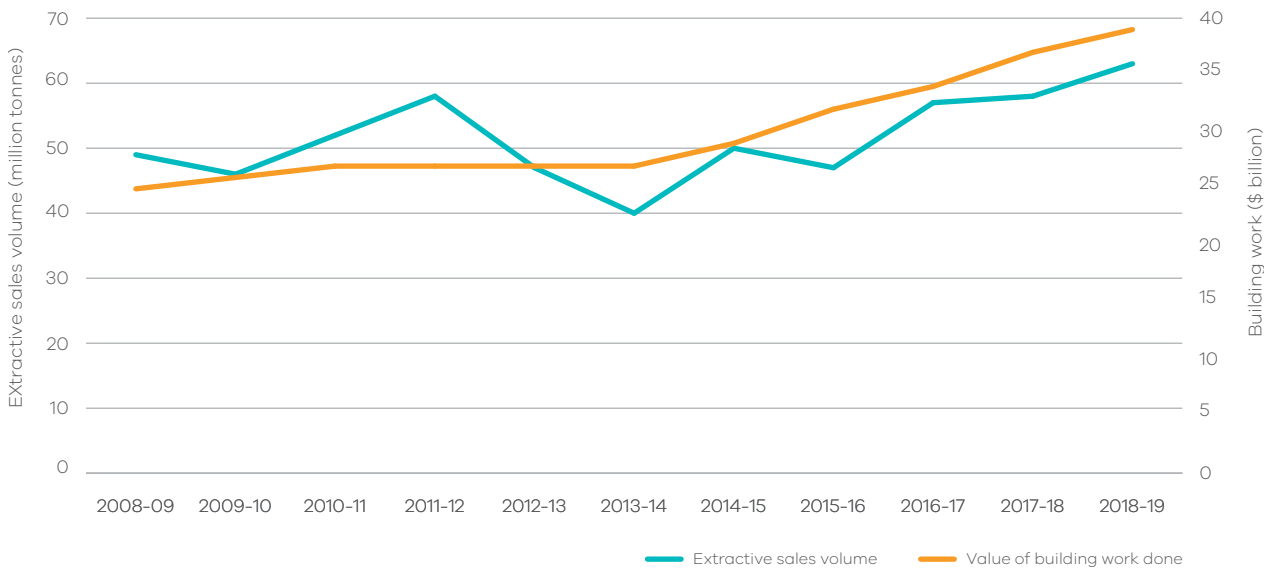
39 Victoria in Future 2019, Department of Environment, Land, Water and Planning.

40 ABS, 8755.0, Construction Work Done, released 27/02/2019.

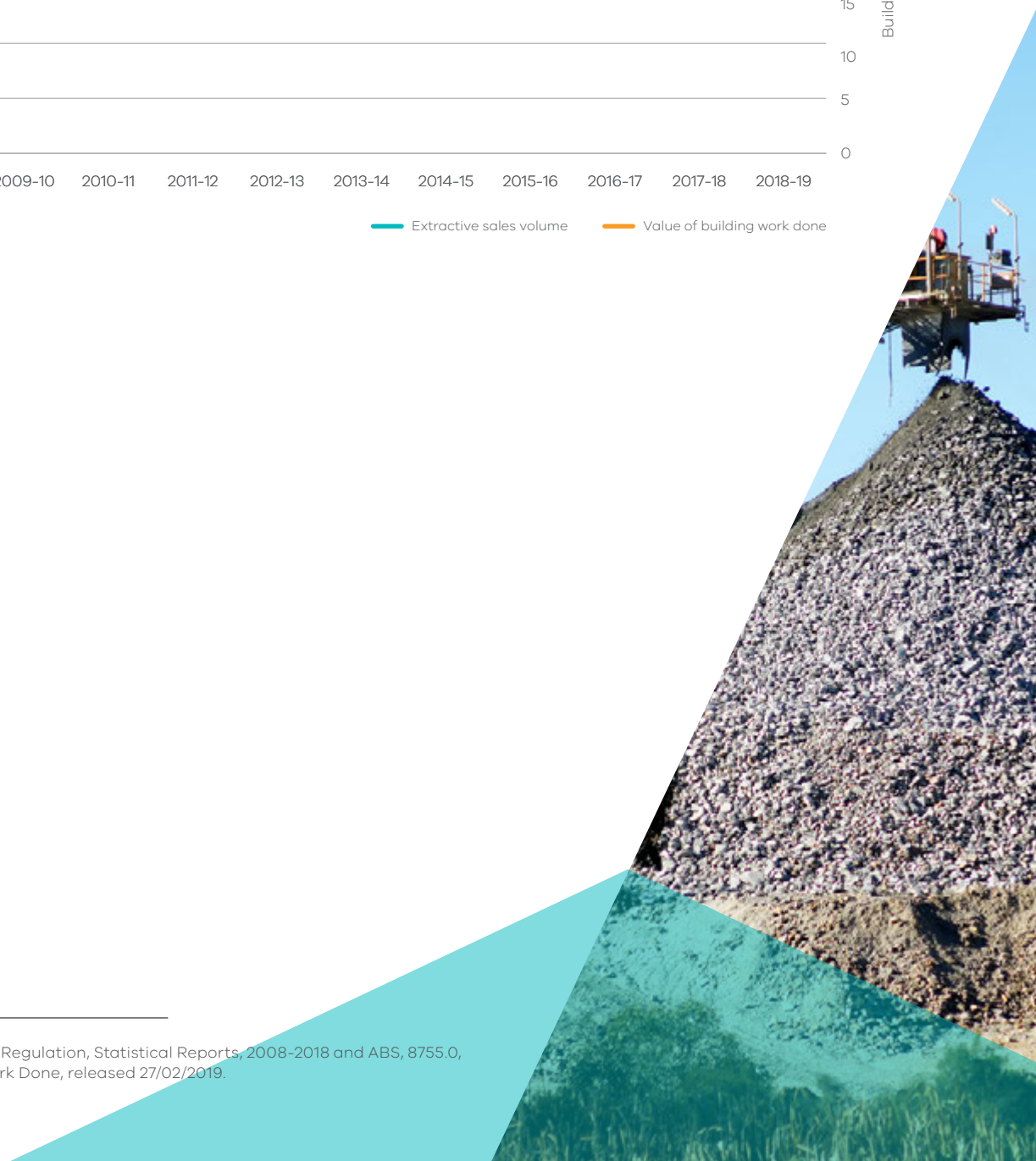
41 PwC, 2016, Extractive Resources in Victoria, Demand and Supply Study, 2015–2050.

42 DJPR, Helping Victoria Grow: Extractive Resources Strategy, June 2018, p 10.

Figure 8: Extractive Resources demand and supply⁴³



43 Earth Resources Regulation, Statistical Reports, 2008-2018 and ABS, 8755.0, Construction Work Done, released 27/02/2019.





EMPLOYMENT

Average number of resources sector jobs: 16,000

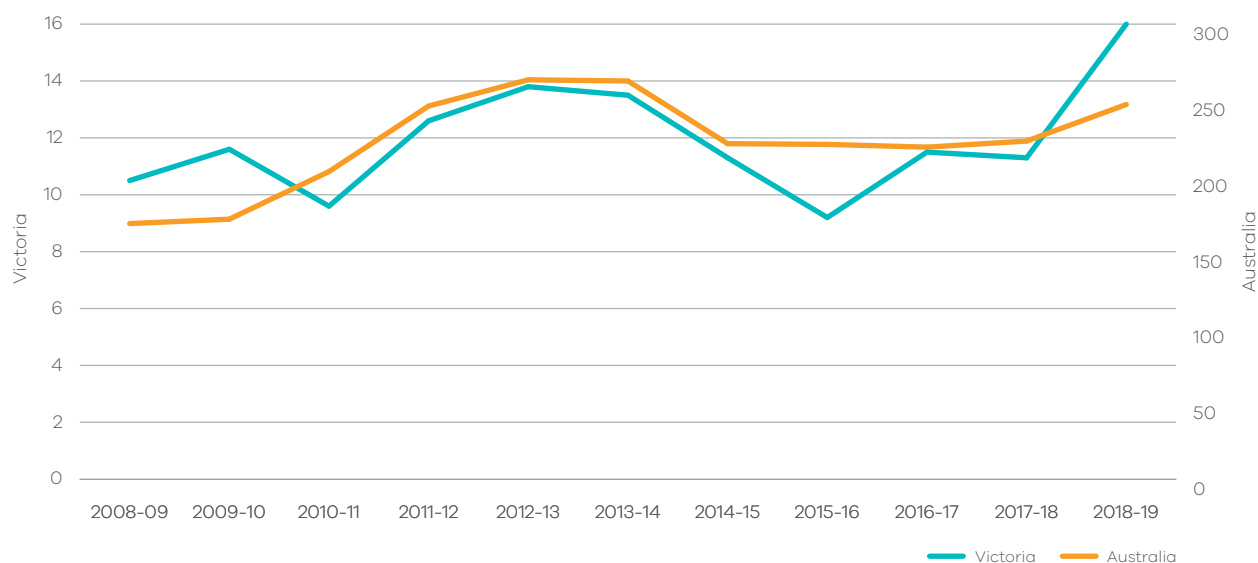
The average number of persons employed in the earth resources sector⁴⁴ significantly increased year-on-year in 2018-19:

- On average, employed persons increased by 41 per cent – 11,300 in 2017-18 up to 16,000 in 2018-19.

The employment figures in 2018-19 represent the highest level of resources sector employment seen in Victoria for over a decade. An increase in employees reflects strong growth in the sector due to increased investment in mineral exploration and increased production in 2018-19. Average annual growth of earth resources sector jobs in Victoria over the past three financial years has firmly outpaced the national average by more than five times: 22 per cent annual average growth in Victoria compared to 4 per cent for Australia.

- Over the past decade, Victoria’s yearly average employment has ranged between 11,100 and 22,700.⁴⁵
- Around 50 per cent of Victoria’s earth resources jobs are outside Greater Melbourne, in rural and regional areas.⁴⁶
- 20 per cent of earth resources jobs are located in Melbourne CBD.⁴⁷
- 42 per cent of Victoria’s earth resources jobs are in mining, followed by 21 per cent in non-metallic mineral mining and quarrying and 20 per cent in oil and gas extraction. The rest are in coal mining, mineral exploration and other mining services.⁴⁸

Figure 9: Earth resources sector employment (thousand, yearly average)⁴⁹



44 Sector defined as the “Mining Division” by the Australian and New Zealand Standard Industrial Classification, 2006 (Revision 2.0).
 45 ABS, 6291.0.55.003, Labour Force, released 26/03/2020.
 46 ABS – Census 2016 Data.
 47 ABS – Census 2016 Data.
 48 ABS – Census 2016 Data.
 49 ABS, 6291.0.55.003, Labour Force, released 26/03/2020.



COMMUNITY

Every three years, CSIRO conducts a national survey to understand citizen attitudes toward the mining industry.⁵⁰ The most recent survey was conducted during 2016–17. In May 2018, the government engaged CSIRO to focus its analysis on Victorian respondent data and provide a report isolating Victorians' perspectives. CSIRO analysed data from 1,612 Victorians to examine a broad range of issues related to mining including, perceptions of benefits and negative impacts related to the industry, levels of trust in the industry, government and other relevant industry stakeholders, and acceptance of the industry overall.

CSIRO's key findings include that Victorians:

- have a moderately positive acceptance of the mining industry, although reported lower levels of acceptance of the industry in their local communities when compared with the rest of Australia;
- view mining as less important for current and future economic prosperity than the rest of the country;
- view job creation, general benefits for regional areas and infrastructure improvements as the three most positive benefits from the mining industry;
- rate environmental impacts, negative impacts on other industry sectors, and impacts on the health of community members living near mining operations as the three most negative impacts of the mining industry; and
- strongly feel the benefits from mining outweigh the costs and mining is worthwhile to continue in Australia.

Contrasting the 2017 responses with those from 2014, key differences in the data relate to the position of mining in Australian life. Specifically, Victorians acceptance of the mining industry remained positive and steady. Agreement that mining will support future prosperity and our way of life decreased and Victorians felt that the role of mining in supporting youth development and employment opportunities increased.

The CSIRO research highlights that procedural fairness is a key driver of trust and acceptance of the mining industry for Victorians.

50 CSIRO, Australian attitudes toward mining: Citizen Survey, 2017.





MINERALS

The minerals sector in Victoria comprises the exploration, mining and processing of gold and other metals, heavy mineral sands, and coal.

Gold

Victoria is a globally significant gold province. Since it was first discovered in Victoria in 1850, over 80 million ounces of gold has been mined from fields across the state. In 2018-19, Victoria's gold endowment continued to be a source of economic development, particularly in regional areas. There has been increased exploration and production success as well as an increase in resources and reserves at the world-class Fosterville deposit. Fosterville is the third-largest gold producing operation in Australia, the lowest cost gold mine in the world⁵¹ and the second highest grade gold mine in the world.⁵²

The Geological Survey of Victoria has undertaken pre-competitive geoscience that demonstrates rocks prospective for gold extend north from well-known areas at Stawell and Bendigo under the plains of northern central Victoria. This is a current focus of mineral exploration by industry.

Gold is an investment asset for governments, central banks and private investors. Gold has strong conductivity properties and as a result has a large demand for use in electronics and computers and is also common in jewellery, decorative items and some coins.

Base metals

Victoria's geology is favourable in parts for base metals, with known prospects and deposits of molybdenum and lead-zinc in the state's east and early stage exploration in the west for copper.

The Geological Survey of Victoria and Geoscience Australia has identified an area of western Victoria which may contain significant base metal deposits, particularly copper. In an area known collectively as the Stavely Arc, pre-competitive geoscience identified a geological setting and associated rock types consistent with the presence of large, disseminated copper (gold-silver) resources, potentially similar in type to those found in parts of South America.

Antimony

Over the past decade, Victoria has emerged as one of the top antimony producers in the world. Antimony is currently considered a critical mineral.⁵³

Costerfield in Central Victoria, is Australia's largest producing antimony mine. Antimony prospects are known in central and Northeast Victoria.

Antimony is used primarily in products such as airplane seats and in the dashboards of cars to make them resistant to fire. Antimony is alloyed with lead to increase charging characteristics in batteries and is increasingly being used in the semi-conductor industry it is also used in electronic screen manufacturing.

51 Mines and Minerals, The world's lowest cost gold mines in Q1 2020 minesandmetals.com/2020/09/the-worlds-lowest-cost-gold-mines-in-q1-2020/#:~:text=Lowest%20cost%20gold%20mines%20worldwide%3A%20Q1%202020%20Overview,%20%20488%20%206%20more%20rows%20

52 Mines and Minerals, Richest Gold Mines in The World minesandmetals.com/2020/07/richest-gold-mines-in-the-world/

53 Australian Critical Minerals Prospectus, March 2019.

Heavy mineral sands (and rare earth elements)

Victoria has globally significant resources and reserves of heavy mineral sands containing zirconium and titanium, both critical commodities in Australia's list of critical minerals.⁵⁴ These elements are concentrated in the heavy minerals zircon, rutile, leucoxene and ilmenite. Rare earth elements may also be contained within accessory minerals such as monazite and xenotime. Most heavy mineral sands activity is focused in the Murray Basin in west and northwest Victoria, but exploration and development opportunities also exist in Gippsland.⁵⁵

Multiple strandline deposits have been developed previously in west and north-west Victoria. Billions of tonnes of heavy mineral sands resources in the WIM-style deposits of the Murray Basin are yet to be developed.

Victoria accounts for 39 per cent of Australia's zircon resources, 22 percent of its ilmenite and 51 percent of its rutile.⁵⁶

Victoria has the potential to supply critical commodities contained within heavy mineral sands for the modern world. As governments globally promote low carbon economies along with advancements in new high-technology products, the demand for rare earth elements is set to increase. The strategic importance of rare earth elements signals potential economic opportunities for Victoria in the future.

Other minerals

Lithium exploration continues in eastern Victoria, which could enable the state to access growth opportunities in energy storage technologies for expanding renewable and electric vehicle markets. Aluminium-lithium alloys also have use in aerospace technology.

Coal

Brown coal continues to be an important economic resource for Victoria.

Historically, demand for brown coal has been driven by Victoria's electricity needs, which have been met from coal-fired generators located in the Latrobe Valley.

In Victoria, coal is mainly used for electricity production and is largely an internal transfer within mining/generation entities.⁵⁷ By world standards Victoria's brown coal has relatively low impurities as it is typically low in ash, sulphur, heavy metals and nitrogen.⁵⁸

Beyond power generation, brown coal can be used as an alternative feedstock to produce a variety of high value products including carbon fibre, graphene, hydrogen and fertiliser. Domestic and international interest in using brown coal to produce these products is strong and the Victorian Government's *Statement on Future Uses of Brown Coal* outlines the state's policy position on projects that seek to use brown coal in a low emissions context.

One of the major projects underway in Victoria is the Hydrogen Energy Supply Chain (HESC) Project - a world-first pilot project to safely and efficiently produce and transport clean hydrogen from Victoria's Latrobe Valley to Japan. The Victorian Government's CarbonNet Project is establishing a commercial-scale carbon capture and storage (CCS) network hub in Gippsland, using world class offshore storage sites in Bass Strait. CarbonNet is a critical enabler for new industries such as clean hydrogen and fertiliser production, decarbonising industry, with potential for negative emissions through biomass. These projects are paramount in delivering world class carbon storage opportunities and enabling the use of coal in Victoria's net zero carbon future.

54 Austrade Australian Critical Minerals Prospectus, March 2019 (NB: The Austrade 2020 Australian Critical Minerals Prospectus has been published).

55 Earth Resources, Mineral Sands Fact Sheet, 2019.

56 Mineral Sands: From Ancient Oceans to Modern Technology, Minerals Council of Australia, 2020, p.

57 Earth Resources Regulation 2018-19 Annual Statistical Report.

58 Earth Resources Victoria.



EXTRACTIVES

Victoria is endowed with a range of extractive resources, including basalt, hornfels, granite, sand, gypsum, kaolin and fine clay. Extractives are key inputs to vital construction products such as concrete, cement, bricks and road paving.

Residential and commercial development along with transport and energy infrastructure, are all key drivers for extractive material demand.

The Victorian Government is investing an unprecedented amount of more than \$100 billion in new infrastructure over 10 years to cater for growth. This includes the Metro Tunnel, the North East Link, and the West Gate Tunnel projects, it is also expected that this will drive demand for extractive resources in the short to medium-term. The supply of extractives will be critical to ensure the successful timely delivery of these projects. The government's Helping Victoria Grow: Extractive Resources Strategy sets out a plan to ensure that extractive resources continue to be available to support the state's growth.

Hard rock

Hard rock production in Victoria is comprised primarily of basalt, granite and hornfels. Hard rock is typically used in the construction industry for road surfacing, building blocks or in groundwork. Critical suppliers of hard rock are located across the state including South Gippsland, Mitchell and Wyndham, where most of the basalt for the Melbourne supply area is sourced from.

Soft rock

Soft rock production in Victoria is comprised primarily of sand and gravel. Soft rock is typically used in glass (sand) and cement manufacturing, and construction services. Soft rock production is concentrated in similar areas of the state to hard rock, with South Gippsland identified as a key supplier of sand and gravel resources to Greater Melbourne, along with other South-Eastern locations including Cardinia and Baw Baw.





GAS

Victoria has the highest number of natural gas users in Australia, with over 2 million connected households and businesses relying on natural gas for heating, cooking and hot water services.

Currently, most of Victoria's gas demand is met from offshore gas reserves in Commonwealth jurisdiction waters in the Bass Strait. Offshore Victoria has supplied, on average, 150 PJ/year to Tasmania, New South Wales (NSW), and South Australia over the last five years. This is forecast to decline to 23 PJ in 2023.⁵⁹

Under the Victorian Gas Program in 2018, the Government invited applications for five offshore areas totalling 1,318 square kilometres to secure future gas supplies. Applications closed on 15 February 2019 and submissions are now being assessed by the Earth Resources Regulator. In 2020 two exploration permits for a period of six months of these areas were granted, these operators are required to work closely with the commercial fishing industry, local communities and government bodies along the south-west coast as they conduct their exploration programs.

Onshore exploration and production of conventional gas will restart from 1 July 2021, following the passing of the Petroleum Amendment Act 2020. A best practice regulatory framework is currently being developed to be in place in time for the restart. All new gas will be prioritised for domestic use.

The ban on hydraulic fracturing activity (fracking) will remain and a bill is currently before Parliament to enshrine the ban in the Victorian Constitution.

The only gas production occurring in Victorian jurisdiction coastal waters is from the Halladale and Speculant Project, about 30 kilometres east of Warrnambool. The operation is accessing an offshore petroleum reservoir from a land base (under a Special Drilling Authorisation for the well-head site onshore) to access reservoirs five kilometres off the coast in the Otway Basin.

⁵⁹ Gas Statement of Opportunities, AEMO, March 2019.



