EARTH RESOURCES SECTOR INDICATORS 2016-2017

Economic Development, Jobs, Transport and Resources

VICTORIA State Government

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INTRODUCTION

This is the first publication of the *Earth Resources Sector Indicators* for Victorian earth resources. This report includes data for the 2016-17 financial year. We will compile and publish data annually, with a goal to develop additional, leading indicators for future reports to support decision-making.

Earth Resources Sector Indicators are designed to:

- provide a snapshot of the earth resources sector;
- establish a framework for collection and analysis of key information to enable effective decision-making regarding earth resource management; and
- complement existing earth resources reporting requirements.

This publication uses the Australian Bureau of Statistics (ABS) definition of mining. This encompasses the extraction and provision of extractives, minerals and oil and gas production. ABS data captures information on petroleum, which includes both oil and gas. Victoria only produces gas.


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MINERALS

Modern mineral exploration technology, pre-competitive data acquisition, and advances in geological knowledge present opportunities to discover or identify new prospective areas and commodity opportunities.

Victoria's mineral resources comprise:

Gold and precious metals

Victoria is one of the world's major gold provinces and has 13 goldfields that have each produced more than 1 million ounces of gold to date. Victorian gold has re-emerged on the international stage with recent exploration and production success at the Fosterville Gold Mine. Encouraging mineral exploration results are being reported across central and western Victoria. Main uses include as an investment asset for governments, central banks and private investors, and in jewellery. The main industrial use for gold is in the electronics industry as small amounts of gold are present in most modern electronic devices.

Base metals

There are several base metal deposits and prospects across Victoria, including copper, lead, zinc, molybdenum, tin, tungsten and nickel. Copper is widely used for electric wiring, electronic goods, air conditioners and heating systems, as well as water pipes. Copper is also used in new energy technologies, including renewable energy infrastructure.

Antimony

A significant antimony resource is located at Costerfield in central Victoria and is currently the source of all of Australia's antimony production. The main use of antimony is as a fire retardant additive to manufactured polymers and plastics. Antimony is also alloyed with lead to increase the charge capacity in batteries and in semi-conductor and electronic screen manufacturing.

Mineral sands (and rare elements)

The Murray Basin in northwestern Victoria contains world-class mineral sands deposits including rutile, ilmenite, zircon, monazite and xenotime. Mineral sand deposits have also been identified in southeastern Victoria in the Gippsland Basin. Monazite and xenotime contain significant amounts of rare earth elements, which are used in high performance magnets, robotics, x-ray screens, fibre optics, and energy efficient lamps.

Other minerals

Early stage exploration for lithium is occurring in eastern Victoria.

Coal

Brown coal from the Latrobe Valley provides the fuel for coal-fired power generation that supplies the majority of Victoria's electricity today. Coal-fired generation's share of electricity capacity will reduce over the coming decades with the retirement of existing aging plants and the need to respond to climate change. The Victorian Government and industry are exploring alternative low or zero emission applications for coal, including converting it to hydrogen and fertiliser for international and domestic markets.

EXTRACTIVE RESOURCES

Victoria has a range of extractive resources used for agriculture, building and construction, including basalt, hornfels, granite, sand, gypsum, kaolin and fine clay. The Victorian Government's pipeline of significant infrastructure projects (including the Metro Tunnel, the North East Link, and the West Gate Tunnel projects) is likely to increase demand for quarry materials in the future.

GAS

Victoria's gas demand is largely met from offshore gas resources located mostly in Commonwealth waters in the Gippsland, Otway and Bass basins. There is currently one producing field (Halladale/Speculant) in Victorian State waters, in the Otway Basin. In May 2018 the Victorian Government released five new oil and gas exploration blocks in the offshore Otway Basin in Victorian State waters.

Onshore unconventional gas exploration and development is banned under Victorian legislation. *The Victorian Fracking Ban Act (2017)*:

- permanently bans all onshore unconventional gas exploration and development – including hydraulic fracturing ('fracking') and coal seam gas; and
- extends the moratorium on conventional onshore gas exploration and development to 30 June 2020.

MINERAL EXPLORATION ACTIVITY

Metres drilled (GSV)[1] : 191,658

Exploration expenditure (ABS)[2] : $40.7M

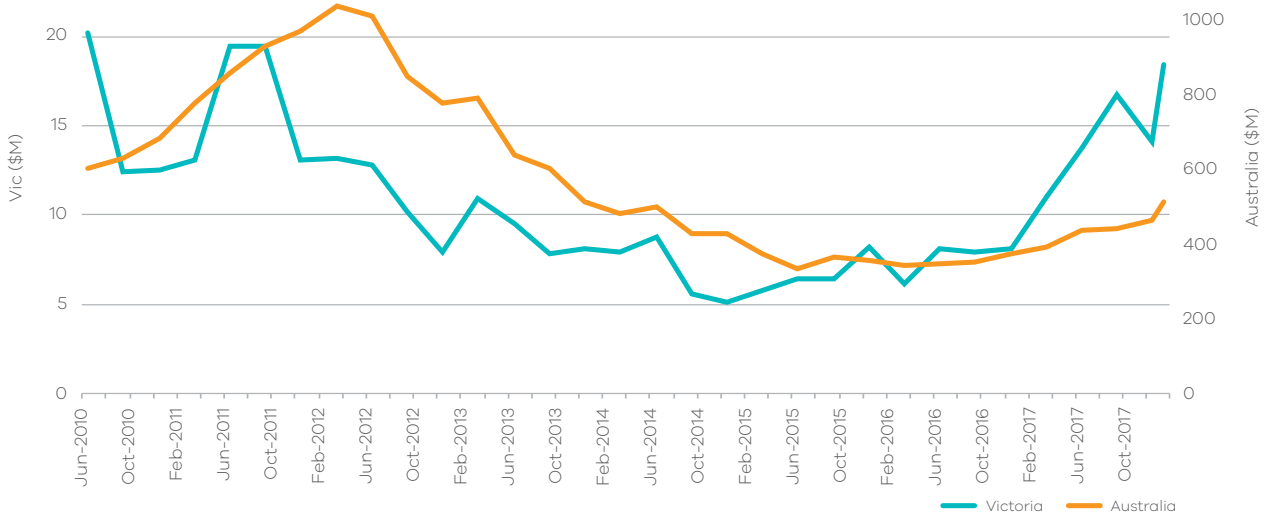
Mineral exploration activity in Victoria has increased year-on-year from 2015-16 to 2016-17:

- metres drilled increased by 30% from 147,164 to 191,658; and
- mineral exploration expenditure increased by 30% from $29M to $41M.

In the last four years Victoria's mineral exploration expenditure has averaged about 2% of Australia's total mineral exploration expenditure. Changes in Victoria's share of exploration expenditure should be considered in the context of Victoria's resource production profile being different to other states. For example, Victoria does not produce iron ore or base metals. Any cyclical effects associated with these commodities will have a greater impact on Australia's total mineral exploration expenditure, and may lead to an increase or decrease in this metric even though this does not reflect an upturn or downturn in mineral sector activity in Victoria.

The chart below shows that the cycle of mineral exploration activity in Victoria has followed a similar path to that for Australia as a whole. They have diverged at times, for example in 2011-12 when mineral exploration expenditure for Australia rose whilst mineral expenditure for Victoria fell.

Chart 1: Mineral exploration expenditure from 2010-2017



Note: Earth Resources Sector Indicators only includes information on mineral exploration expenditure, as the petroleum exploration data for Victoria has been suppressed for confidentiality reasons. The recent release of offshore areas for gas exploration may result in an increase in exploration expenditure in the future if these blocks are taken up.

1 *Minerals only (excludes extractives, coal, gas and oil) Source: GSV*

2 *Data Source: ABS publication series 8412.0, Minerals and Petroleum Exploration, abs.gov.au/ausstats/abs@.nsf/mf/8412.0 Table 4) Mineral and Petroleum Exploration (8412.0) is based on a Census of onshore and offshore operations, however, the petroleum exploration number for Victoria has been suppressed for confidentiality reasons.*

LICENCES

No. of new mineral licences granted[3]: 36

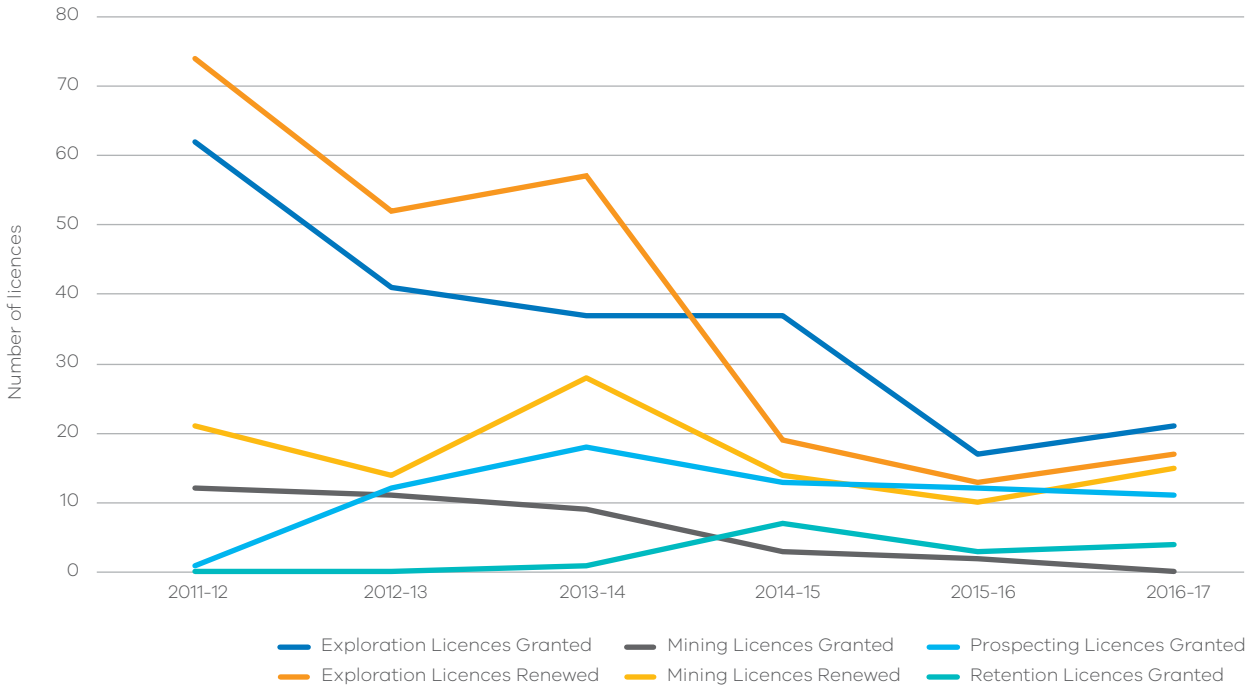
No. of renewed mineral licences[4]: 32

Number of miner's rights: 7,293

There has been an increase in licences granted or renewed in most categories from 2015-16 to 2016-17. The number of licences granted or renewed increased from a six year low of 57 in 2015-16 to 68 in 2016-17.

Higher numbers of licence grants or renewals are a lead indicator of mining activity because these are granted ahead of mining activity occurring.

Chart 2: Licences granted or renewed



3 *Earth Resources 2016-17 Regulation Statistical Report page-12*
4 *Earth Resources 2016-17 Regulation Statistical Report page-12*

The increase in retention licences in the below table highlights an increase in a number of mineral projects progressing from exploration to advance exploration/scoping/pre-feasibility stage. Conversion of a mineral licence to a retention licence was only permissible for 12 months after the 2012 changes to the *Mineral Resources (Sustainable Development) Act 1990* – so all retention licences granted likely represent exploration licence conversions from 2014 onwards.

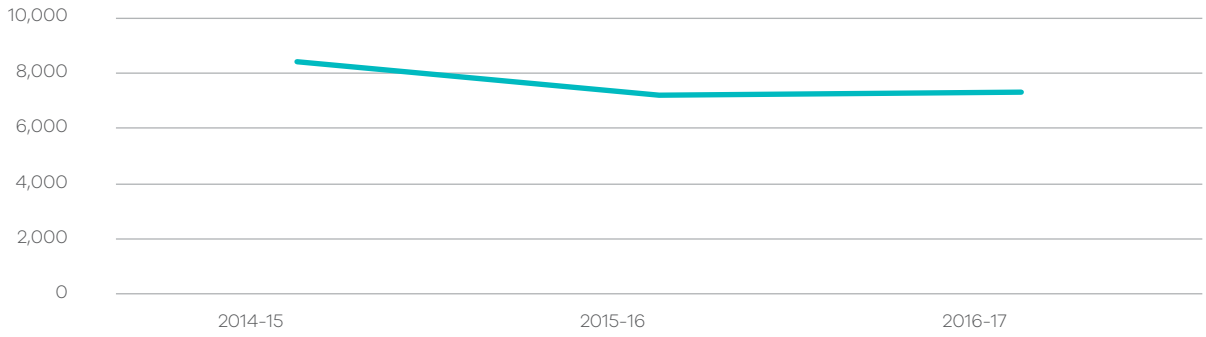
Table 1: Licences current as at 30 June 2017[5]

Tenement Type	2012	2012	2014	2015	2016	2017
Exploration Licences	326	311	271	247	211	180
Mining Licences	208	212	191	171	170	162
Prospecting Licences	1	13	31	41	51	54
Retention Licences	0	1	1	8	11	15
Totals	**535**	**537**	**494**	**467**	**443**	**411**
Change year-on-year (%)	2.9	0.4	-8.0	-5.5	-6.0	-6.4

5 *Earth Resources 2016-17 Regulation Statistical Report page-11*

MINER'S RIGHTS

Chart 3: No. of miner's rights 2014-2017



In Victoria, prospectors must have a miner's right to search for minerals on Crown land or private land where the activity is allowed. In addition to holding a miner's right, prospectors are expected to seek permission to access land. A miner's right can only be issued to an individual and not corporations. Prospecting can be a recreational activity or a source of income for some prospectors.

Prospecting and fossicking involves the use of hand tools e.g. metal detectors, pans and sluices, in the search for gold, gemstones and other minerals. Prospectors have discovered many of the world's largest gold nuggets found in the Golden Triangle in central Victoria. Similarly, elsewhere, gemstone fossickers have found sapphires, zeolites and agate.[6]

Recreational prospecting is often conducted on public land and has health and wellbeing benefits for users. 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.[7]

6 *earthresources.vic.gov.au/earth-resources-regulation/recreational-prospecting-and-fossicking*
7 *veac.vic.gov.au/documents/Q&As-v2.pdf*

CAPITAL EXPENDITURE

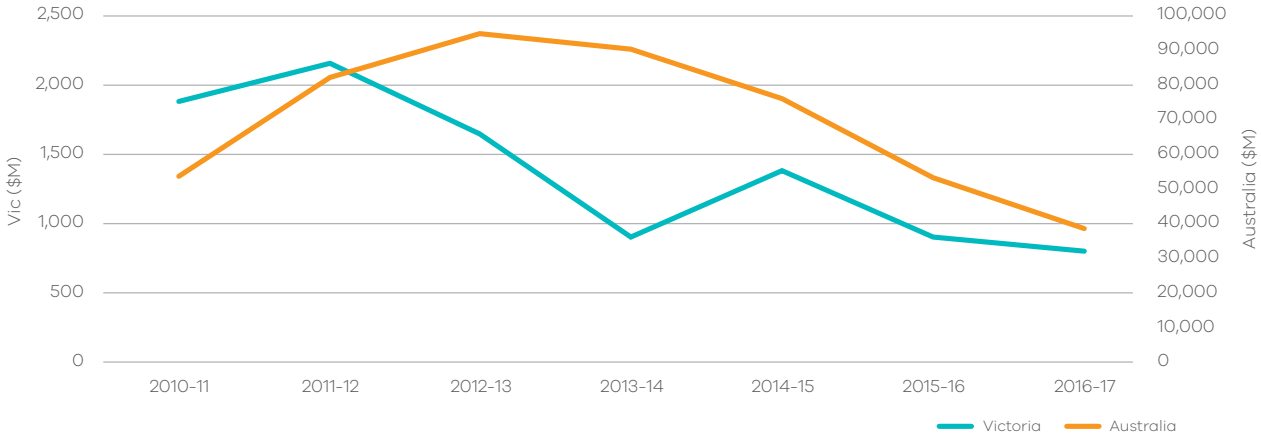
$ of new capital expenditure (ABS)[8]: $805M

The metric New Capital Expenditure contains estimates of actual and expected new capital expenditure (e.g. mining equipment, development) by private mining businesses in Australia.

This metric, which includes minerals and petroleum expenditure (but excludes extractives), was at an eight year low in 2016-17 of $805M, a decline of 11.2% from $907M in 2015-16.

Capital expenditure is a lag indicator because it is the outcome of investment decisions taken in the past rather than the present.

Chart 4: Resources Capital Expenditure 2010-2017



8 *Data Source: ABS publication series 5625.0, Private New Capital expenditure and expected expenditure. ABS reports on this metric for mining as a whole – includes some exploration expenditure. .abs.gov.au/ausstats/abs@.nsf/mf/5625.0*

PRODUCTION

Quantity of production: Extractives: 57.4 M tonnes, Minerals (see Table 2 below)
Value of production: Minerals $750.1M, Extractives $849.3M, Total: $1599.4[9]

Victoria has a less diverse resource endowment and production of minerals compared to other states. Production data is outlined below.

Production data[10]

Table 2:

Commodity	Unit	2015-16	2016-17	Change
Brown coal	1000 tonnes	59,757	56,095	-6%
Gold	Ounce	256,653	329,452	28%
Antimony	Tonnes	5,945	5,138	-4%
Zircon	Tonnes	52,026	45,597	-12%
Rutile	Tonnes	90,318	73,812	18%
Ilmenite	Tonnes	57,763	44,944	-22%
Feldspar	Tonnes	30,730	-	N/A
Gypsum	Cubic metres	314,759	282,720	-37%
Kaolin & fine clay	Tonnes	202,229	192,150	-10%

Table 3: Gas production[11]

Commodity	Unit	2015-16	2016-17	Change
Gas	Petajoules (PJe)		20.8	N/A

9 *Note: These figures exclude gas as the value of gas production is commercially sensitive.*
10 *This information (except gas production) was collected from industry by the Earth Resources Regulator*
11 *This figure only includes gas sourced from Victorian jurisdiction, in State waters. Approximately 95% of the gas processed in Victoria is produced in Commonwealth waters. There was no gas produced in Victoria's jurisdictional waters in 2015-16. Source: Earth Resources Regulation 2016-17 Statistical Report page-9, Gas production figure for Halladale, Blackwatch and Speculant (19,598 Million standard cubic feet converted into Petajoules). Iona gas storage is not included in this figure.*

GOLD

In recent years gold has been one of the best performing mineral sectors in Victoria with production increasing by 28% year-on-year, and the value of production increasing by 26% from 2015-16 to 2016-17.

EXTRACTIVES

Extractives sales volume and value rose 21% and 8% respectively year-on-year from 2015-16 to 2016-17. This reflects the strength of the construction sector in the Victorian economy.

Higher building activity leads to higher demand for quarry materials such as sand, stone and gravel. Building and construction activity are important sources of economic activity and employment growth for Victoria. Access to high quality and accessible extractive mineral resources is essential to support future construction activity and related employment activity.

The number of work authorities granted decreased from 13 in 2015-16 to 9 in 2016-17.[12] However with the increased demand for extractives for infrastructure projects this number is likely to increase in future.

12 *Unpublished Earth Resources Regulation DEDJTR data.*

Table 4: Extractives volume and value of production[13]

Product Group	Product Type	2015-16 Sales Volume (million tonnes)	2016-17 Sales Volume (million tonnes)	2015-16 Sales Value ($M)	2016-17 Sales Value ($M)
Hard Rock	Basalt	18.2	20.7	307.3	334.0
	Gneiss	0.0	0.0	0.0	0.0
	Granite	5.0	5.7	95.4	101.1
	Hornfels	3.3	5.0	59.3	73.1
	Quartzite	0.1	0.1	0.7	0.5
	Rhyodacite	1.6	1.8	35.8	38.0
	Schist	0.2	0.2	3.7	4.0
	Slate	0.0	0.0	0.6	1.0
	Trachyte	0.0	0.0	0.5	0.5
Hard Rock Total		28.4	33.5	503.3	552.2
Soft Rock	Clay & clay shale	1.3	1.1	3.7	2.6
	Limestone	1.6	1.8	30.3	25.6
	Sand & gravel	12.5	16.6	207.2	216.7
	Sedimentary	2.6	3.0	26.8	37.1
	Scoria	0.6	0.7	11.0	11.1
	Soil	0.0	0.0	0.4	0.4
	Tuff	0.3	0.7	2.8	3.4
Soft Rock Total		18.9	23.9	282.2	296.9
GRAND TOTAL		47.3	57.4	785.5	849.3
Change		21%		8%	

13 *Earth Resources 2016-17 Regulation Statistical Report page-20*

Table 5: Mineral production sales values (A$ million)

Mineral	2014-15	2015-16	2016-17	Change year-on-year (%)
Gold	286.9	411.4	519.8	26.%
Antimony	37.8	30.6	33.6	10%
Heavy Mineral Sands (Zircon, Rutile, Ilmenite)	185.1	175.9	188.5	7%
Industrial Minerals (Feldspar, Gypsum, Kaolin & fine clay)	10.2	10.0	8.0	-20%
Others (including silver, peat and quartz)	0.1	0.6	0.2	-6%
Total (excl. brown coal[13])	520.1	628.5	750.1	17%

14 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.

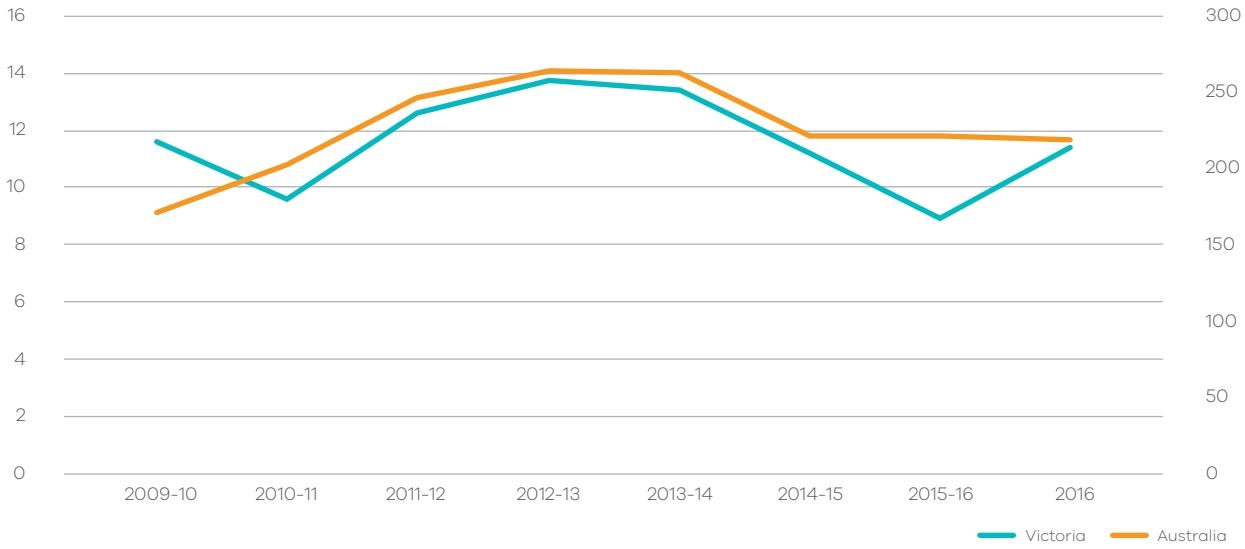
EMPLOYMENT

No. of resources sector jobs: 11,500[15]

Employment in the earth resources sector as at the May quarter 2017 was 11,500. However average yearly employment in the mining industry increased by 27% in 2016-17 compared to 2015-16 from 8,900 to 11,400 (see chart below). Key points include:

- In the past eight years earth resources sector employment has ranged between 8,900 and 13,800 annually.
- Approximately 45% of these jobs are outside greater Melbourne in rural and regional areas.
- 32% of these jobs are in metal ore mining, with the rest in oil and gas extraction, coal mining, exploration, non-metallic mineral mining and quarrying and other mining services.

Chart 5: Earth Resources Sector Employment 2009-2017



15 *Data Source ABS Labour force series 6291.0.55.003 abs.gov.au/ausstats/abs@.nsf/mf/6291.0.55.003*

EXTRACTIVES DEMAND/SUPPLY

Extractive supply: 57.4M tonnes of total production (See Table 4)

Victorian Construction activity (ABS data trends)[16]: $44,076,116, 000

The value of construction activity in Victoria in the financial year 2016-17 was approximately $44 billion, according to ABS data, up 6.6% from $41.3 billion in 2015-16.

- This value includes all approved building activity involving the construction of new buildings or structural alterations, extensions or other additions made to existing buildings.
- Record building activity has led to higher demand for building materials such as sand and gravel.

The average distance to market for Melbourne is 112km (the estimated average transport distance for all raw building materials).

- Distance to market is an important metric because the cost of transporting building materials directly impacts construction costs.
- We plan to monitor and report on this figure every five years through a demand and supply study, to inform strategic land-use planning decisions.

Note: Reserve estimates are not currently available. The Department is considering ways these estimates can be collected, and reported in future.

COMMUNITY CONFIDENCE

CSIRO Australian attitudes to mining[17]: Victorians have a reasonably positive view.

This CSIRO Australian attitudes to mining citizen survey 2017 summarises the key findings from a survey of Australian participants about their attitude toward mining industry, examining the relationship between mining and society. This survey includes unpublished data for Victoria obtained from CSIRO. This metric is important in assessing the community's social licence for mining activities to operate.

From the survey, CSIRO assessed the response of Victorians to the question "To what extent do you accept mining in Australia" with a score of 3.50 where 1 is not at all and 5 is very much so.

16 *ABS publication series 8755.0 September 2017*
17 *publications.csiro.au/rpr/pub?pid=csiro:EP178434*

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