

## The Australian Resources Sector—its contribution to the nation, and a brief review of issues and impacts

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## Introduction

It is undeniable that minerals and energy resource development is a key contributor to the Australian economy, and in particular to the state of Western Australia. The recent 'mining boom' has been much discussed in the last 7 years or so and has brought considerable revenue to state and federal governments. As well as being of economic benefit, mining is essential to providing the raw materials upon which modern society depends.

The sector also has significant inputs to much technological development and environmental research in Australia. Also important is the fact that domestic coal provides in excess of 80 per cent of Australia's relatively cheap electricity that powers the nation.

On the negative side, there are individuals and groups critical of the resources sector. Criticisms include:

- Australia is merely a quarrying nation with low levels of further processing;
- mining can cause environmental degradation, as well as having health, safety and social impacts;
- consumption of coal accounts for a major portion of the country's greenhouse gas emissions;
- mining is unsustainable as the resources removed are not renewable.

The recent oil spillage in the Gulf of Mexico and the 2009 oil leak in the Timor Sea generated a strong negative public perception of the petroleum sector. Fortunately, land-based resource developments have had a much better environmental record in recent years. However, in times past concerns were raised over issues such as excessively high levels of lead in the blood of children in Port Pirie.

The aim of this paper is not to balance the benefits of mining against its drawbacks; rather it is to provide information on a sector that has become an important national talking point.

## The Resources Sector

The key attributes of the Australian resources—the minerals, oil and natural gas industries—sector are outlined below.

### The minerals industry

The minerals industry—defined as covering the exploration and mining of minerals (including coal) and the associated minerals processing industry—accounts for 8 per cent of gross domestic product (GDP). The Australian minerals sector is in the top five producers of most of the world's key mineral commodities including:

- The world's leading producer of bauxite, alumina, rutile, and tantalum;

- The second largest producer of lead, ilmenite, zircon and lithium;
- The third largest producer of iron ore, uranium and zinc;
- The fourth largest producer of black coal, gold, manganese and nickel; and
- The fifth largest producer of aluminium, brown coal, diamonds, silver and copper.

Additionally, Australia is the world's largest exporter of black coal, iron ore, alumina, lead and zinc and the second largest exporter of uranium.<sup>1</sup>

### **Australia's minerals distribution**

Geologically, Australia is an ancient continent with an abundant supply of minerals. Western Australia and Queensland are the most resource rich states. Of Australia's roughly three hundred and forty operating mines, almost half are in WA.

Western Australia produces a range of mineral commodities including 70 per cent of Australia's gold, almost all of its iron ore, nickel, diamond, tantalum and lithium, and major proportions of its bauxite and mineral sands. The Eastern Goldfields region, including Kalgoorlie, contains major gold and nickel mines. The huge open cut 'Super Pit' operation, an amalgamation of a number of smaller underground mines, now produces in the order of 850 000 ounces of gold per annum. The Hamersley Basin in the Pilbara region hosts major iron ore deposits. Manganese is also mined in this region. In the south west there are world class bauxite and mineral sands deposits. Also in the southwest is the world's largest hard-rock tantalum deposit at Greenbushes. The Argyle diamond mine in the Kimberley region is in the far north, together with smaller scale diamond deposits.

Queensland has the world's leading lead-zinc-silver district extending from Mount Isa to Cannington in the centre and north western part of the state. Additionally, there are the huge bauxite operations on the western side of Cape York, major coal deposits in the Bowen Basin in the centre east of the state (also the focus for the emerging coal seam methane industry), a major gold province around Charters Towers where production is continuing despite over 100 years of production and, mineral sands operations on North Stradbroke island.

New South Wales has the huge Broken Hill lead-zinc-silver deposit which is still in production after over 120 years of mining. Additionally it has major coal deposits in the Hunter, Illawarra, Lithgow and Gunnedah regions, gold and copper in the central west of the state, base metals and gold mines in the Cobar region, and heavy minerals sands in the Murray Basin in the State's southwest.

Victoria has gold mines in the west and centre of the State, which was one of the major gold producing regions in the 19<sup>th</sup> century. The early gold rushes brought increases in population and changes to society, but also increases in wealth. In a ten year period to 1861, Victoria produced 750 tonnes of gold, some 40 per cent of the world's output in that period.<sup>2</sup> Victoria has extensive

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1. Minerals Council of Australia (MCA), *The Australian minerals industry and the Australian economy*, MCA, Canberra, March 2010, viewed 31 May 2010, [http://www.minerals.org.au/data/assets/pdf\\_file/0017/32804/Aus\\_min\\_industry\\_fact\\_sheet\\_March\\_2010.pdf](http://www.minerals.org.au/data/assets/pdf_file/0017/32804/Aus_min_industry_fact_sheet_March_2010.pdf)

2. P Crabb, *Murray-Darling Basin resources*, Murray Darling Basin Commission', Canberra, 1997, p. 194.

brown coal deposits—hundreds of years of reserves—in the Latrobe Valley (in the south east of the state) with the coal used in adjacent power stations.

South Australia contains the huge Olympic Dam mine in the centre of the State, which is the fourth largest copper deposit and the largest uranium deposit in the world. It contains significant quantities of gold and silver and is Australia's largest underground mine. Additionally there are extensive opal deposits around Coober Pedy and coal at Leigh Creek. Australia's largest onshore oil and gas fields are located in the Cooper-Eromanga Basin in the north east of the State.

The Northern Territory contains major uranium deposits in the Alligator Rivers region east of Darwin; bauxite at Gove; manganese on Groote Eylandt; and lead-zinc in the McArthur River mine in the Roper River district. The Tanami region in the west of the Northern Territory is an important gold province which also extends into Western Australia. Significant oil and gas fields lie to the north of Darwin in the Timor Sea.

Tasmania's mining sector has in general declined in importance over the last decade, but significant quantities of gold, copper, silver and zinc are still produced, and exploration for these and other commodities continues.

## The oil and natural gas industries

### Oil

Australia's crude oil production has dropped from nearly 600 000 barrels per day in 1990 to under 500 000 barrels per day in 2009. At the same time Australia's consumption increased from around 600 000 barrels per day in 1990 to around 935 000 barrels per day in 2008.<sup>3</sup> These trends are expected to continue over the next decade, leading to a worsening trade imbalance in this strategic commodity.<sup>4</sup>

Most of Australia's oil resources are located off the coast of Western Australia in the Carnarvon Basin, approximately 125 kilometres northwest of Dampier; in the Timor Sea off the northwestern coastline of the Northern Territory (the Bonaparte Basin); and off the south eastern coastline of Victoria (the Gippsland Basin). Western Australia has 64 per cent of Australia's economic demonstrated resources of crude oil, 75 per cent of condensate (light oil) resources and 57 per cent of liquefied petroleum gas (LPG) resources.<sup>5</sup>

The Woodside-operated north west shelf venture (NWSV) facilities (located in the offshore Carnarvon Basin, WA), represents an investment of \$27 billion to date. It is Australia's largest oil and

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3. *BP Statistical Review of World Energy*, June 2009, p. 11, viewed 1 June 2010, [http://www.bp.com/liveassets/bp\\_internet/globalbp/globalbp\\_uk\\_english/reports\\_and\\_publications/statistical\\_energy\\_review\\_2008/STAGING/local\\_assets/2009\\_downloads/statistical\\_review\\_of\\_world\\_energy\\_full\\_report\\_2009.pdf](http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2008/STAGING/local_assets/2009_downloads/statistical_review_of_world_energy_full_report_2009.pdf)
  4. Australian Petroleum Production & Exploration Association (APPEA), *Key statistics* 2010, APPEA, Canberra, 2010, viewed 31 May 2010, [http://www.appea.com.au/images/stories/Publications/Key\\_Stats\\_2010\\_lores.pdf](http://www.appea.com.au/images/stories/Publications/Key_Stats_2010_lores.pdf)
  5. Department of Resources, Energy and Tourism, *Energy in Australia 2010*, Australian Bureau of Agricultural and Resource Economics (ABARE), Canberra, pp. 1–8, viewed 1 June 2010, [http://www.abare.gov.au/publications\\_html/energy/energy\\_10/energyAUS2010.pdf](http://www.abare.gov.au/publications_html/energy/energy_10/energyAUS2010.pdf)

natural gas resource development and currently accounts for more than 40 per cent of Australia's oil and natural gas production. The NWSV comprises six equal-share partners: Woodside (operator), Shell, BP, BHP Billiton Petroleum, Chevron and Mitsubishi/Mitsui. The NWSV's offshore production facilities include the North Rankin A, Goodwyn A and Angel platforms, and the oil producing Cossack Pioneer floating production storage and offloading facility (FPSO). Other large oil and condensate producers operating on the Northwest Shelf include the BHP Stybarrow, Griffin and Pyrenees operations and the Chevron-operated Barrow Island.

The Esso/BHP Gippsland Basin operations are still substantial oil, condensate, and natural gas producers. These fields have been in production since the late 1960s. Other significant oil, condensate and natural gas producers include the Santos controlled Cooper/Eromanga Basin onshore operations in central Australia.

## **Natural gas**

Australia is much better endowed with resources of gas compared to its resources of oil. The bulk of these resources are again located offshore northwest Western Australia (Carnarvon and Browse Basins) and in the Timor Sea (Bonaparte Basin). Important gas resources that have underpinned the eastern Australian natural gas market are contained in the Victorian Gippsland Basin and the onshore Cooper/Eromanga basin in southwest Queensland/northeast South Australia. The huge Western Australian resources of natural gas, in addition to providing domestic gas for Western Australian use have underpinned Australia's liquefied natural gas (LNG) export sector. Gas exports began in the late 1980s at some 7.5 million tonnes (Mt) per year and have now increased to around 16 Mt tonnes per annum. LNG exports are projected to increase to around 50 Mt a year by 2030 if all projects under present evaluation come on line. These include a number of coal seam methane (CSM) projects in Queensland.

## **Key benefits of the resources sector**

The key benefits of the resources sector are economic—contribution to exports, gross domestic product (GDP), employment, government revenue, gross state product, investment and new project development. Other benefits include contributions to rural and regional development, technology innovation and environmental research. These issues have long been referred to and reported on by private sector resource companies, peak body industry organisations and relevant Federal and State Government departments.

It goes without saying that the mining, oil and natural gas industries provide the necessities of everyday life. Metals are used in the manufacture of almost all consumer durables including cars, aircraft, computers, and communications infrastructure. Steel and aluminium are used extensively in the construction industry. Oil and natural gas underpin the transportation sector, plastics manufacture and industrial, commercial and domestic heating.

## Economic Benefits

The economic benefits of the resources sector include contributions to exports, GDP, employment, government revenue and investments in infrastructure and R&D.

Australia is currently in the midst of another minerals boom, which is providing record levels of mineral royalties, especially to the resource rich states of Western Australia and Queensland, and high levels of company taxation to the Federal Government. New South Wales is also a major beneficiary with record production and shipments of coal. The Reserve Bank of Australia has indicated that despite subdued conditions in Europe, strong growth in Asia is contributing upward pressure on prices for raw materials.<sup>6</sup>

The latest resources boom, which started in 2003, has already doubled Australia's terms of trade—the relative price of exports to imports—to its highest level since the 1950s wool boom and the second highest level since records began in the 1870s. This is certain to go even higher once the 100 per cent increase in iron ore contract prices, recently negotiated by BHP Billiton, takes effect. Resources income will rise further with the four-fold increase in gas exports during the coming decade—the result of recent deals by Woodside and Chevron.<sup>7</sup>

Strong economic growth in the emerging global market economies, notably China (11 per cent) and India (9 per cent), with associated strong demand for mineral and natural gas resources such as coal, iron ore and LNG, have counterbalanced moderating growth in the US, Japan and Europe. The pace of economic expansion in other emerging economies remains strong.

## Contribution to Exports

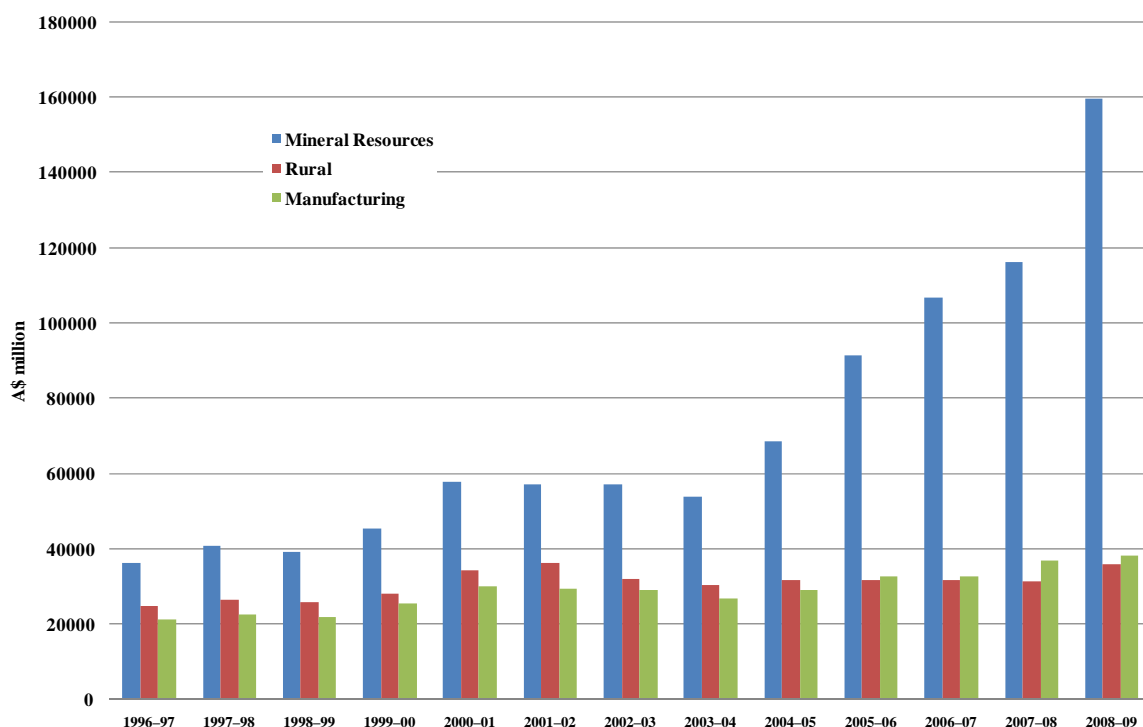
Australia's mineral and petroleum sector is Australia's major export commodity earner, which is clearly illustrated in Figure 1.

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6. Reserve Bank of Australia (RBA), *Statement by Glenn Stevens, Governor: monetary policy decision*, media release, 4 May 2010, viewed 3 June 2010, <http://www.rba.gov.au/media-releases/2010/mr-10-07.html>.

7. P Cleary, 'Sea hunt for another oil boom', *Weekend Australian*, 3 April 2010, Inquirer, p 1, viewed 3 June 2010, [http://parlinfo.aph.gov.au/parlInfo/download/media/pressclp/8LCW6/upload\\_binary/8lcw60.pdf;fileType=application/pdf](http://parlinfo.aph.gov.au/parlInfo/download/media/pressclp/8LCW6/upload_binary/8lcw60.pdf;fileType=application/pdf)

Figure 1: Australia’s major commodity export earnings



Source: Australian Bureau of Agricultural and Resource Economics (ABARE), *Australian Commodity Statistics 2009*, viewed 2 June 2010, [http://www.abare.gov.au/interactive/09acs\\_dec/](http://www.abare.gov.au/interactive/09acs_dec/)

The resources sector contributed just under \$160 billion to export earnings in 2008–09, compared with \$35.9 billion for the rural sector and \$38.3 billion for manufacturing. Additionally it contributed over 80 per cent of total commodities exports, close to 70 per cent of total merchandise exports and 56 per cent of total goods and services exports.

The growth of mineral commodity exports since 2003–04 has been phenomenal, driven largely by strong demand, particularly for iron ore and coal. The value of iron ore exports increased from \$5.3 billion in 2003–04 to \$34.2 billion in 2008–09 while metallurgical and thermal coal increased in value from \$6.5 billion to \$36.8 billion and \$4.4 billion to \$17.9 billion respectively over the same period.

Other stellar performers were liquefied natural gas (LNG) which increased from \$2.2 billion to \$10.1 billion, refined gold which increased from \$5.5 billion to \$16.2 billion, alumina which increased from \$3.8 billion to \$6 billion and uranium oxide which increased from \$364 million to nearly \$1 billion over this same time frame.



The composition of Australia's mineral and petroleum exports in 2009 is shown in Figure 2. High quality coking and steaming coal produced in both New South Wales and Queensland constitute by far the largest components with 23 and 11 per cent respectively, or 34 per cent as a combined total, followed by iron ore at 21 per cent, gold 10 per cent, base metals 8 per cent, LNG and crude oil with 6 per cent each. Other important components include alumina and aluminium, the titanium group of metals and uranium oxide.

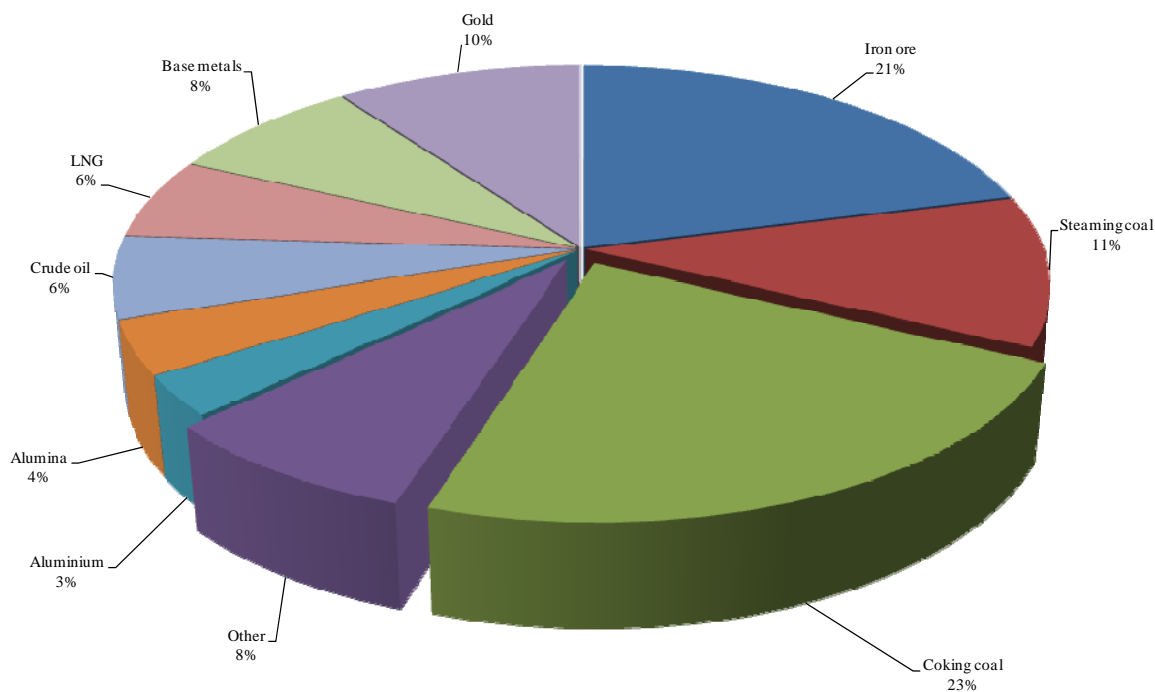
An interesting aside is that despite coal attracting negative press because of the concern over CO<sub>2</sub> emissions from fossil fuels, some 41 per cent of the world's electricity is generated using coal and this proportion is continuing to increase. In Australia, over 80 per cent of our electricity is generated by coal-fired power stations. In capital intensive industries, such as power generation, it is not technologically feasible to achieve rapid change. Therefore, if there was to be a global move away from the use of coal because of climate change concerns (and there are no indications that this is likely to happen as the trend is towards increasing the use of coal) such a transition may take decades.<sup>8</sup>

Australia is blessed with very large reserves of extremely high quality coal, both thermal, used for making steam and generating electricity, and metallurgical (coking), used for steel making which are located in both Queensland and New South Wales. The coal industry is also the minerals industry's largest employer. A technology involving carbon capture and storage (CSS) which takes the CO<sub>2</sub> emitted from coal-fired power plants and reinjects it into suitable rock formations underground is actively being evaluated. If CSS is proven to be viable and reliable and can be implemented on a large scale, coal's environmental credentials could dramatically improve.

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8. P Knights and M Hood, *Coal and the Commonwealth, the greatness of an Australian resource*, University of Queensland, Brisbane, October 2009, p. 1, viewed 3 June 2010, [http://www.eait.uq.edu.au/docs/Publications/Coal%20and%20the%20Commonwealth\\_prologue\\_lores.pdf](http://www.eait.uq.edu.au/docs/Publications/Coal%20and%20the%20Commonwealth_prologue_lores.pdf)

Figure 2: Composition of Australian Mineral and Petroleum Exports



Source: Australian Bureau of Agricultural and Resource Economics (ABARE), *Australian Commodity Statistics 2009*, viewed 2 June 2010, [http://www.abare.gov.au/interactive/09acs\\_dec/](http://www.abare.gov.au/interactive/09acs_dec/)

### Contribution to gross domestic product and employment

The Australian minerals industry is defined as covering the exploration and mining of minerals (including coal) and the associated minerals processing industry. The minerals sector accounts for 8 per cent of GDP and is responsible for direct employment of 158 000 and an estimated indirect employment of 505 600. Mining companies contributed more than \$7 billion in royalties as part of \$21 billion paid in State and Federal taxes in 2008–09, almost 50 per cent more than in the previous year.<sup>9</sup>

Mining activity contributes significantly to the State’s and Territory Gross State Product. These contributions are outlined—represented by Industry Gross Value Added (GVA) in Table 1.

9. Minerals Council of Australia (MCA), *The Australian minerals industry and the Australian economy*, MCA, Canberra, March 2010, viewed 3 June 2010, [http://www.minerals.org.au/data/assets/pdf\\_file/0017/32804/Aus\\_min\\_industry\\_fact\\_sheet\\_March\\_2010.pdf](http://www.minerals.org.au/data/assets/pdf_file/0017/32804/Aus_min_industry_fact_sheet_March_2010.pdf)

**Table 1: State Industry Gross Value Added (GVA), Mining, 2008–09**

State	Value \$m	Per cent of total state GVA
Western Australia	39 674	25.3
Queensland	18 603	8.3
New South Wales	9 995	2.6
Victoria	4 972	1.8
Northern Territory	4 325	26.5
South Australia	2 762	3.5
Tasmania	481	2.1

Source: Australian Bureau of Statistics (ABS), *Australian national accounts state accounts 2008–09*, cat. no. 5222.0, ABS, Canberra, December 2009, viewed 3 June 2010, <http://www.abs.gov.au/ausstats/abs@.nsf/mf/5220.0>

Note: GVA is a measure of GDP.

It is evident that the mining industry is vitally important to the Western Australia and Northern Territory economies, where it accounts for more than 25 per cent the States GVA. Mining activity in Queensland also forms a large share of GVA. Even in the other states where GVA is much smaller in percentage terms, absolute value amounts are very significant.

It is also reasonable to assume that a percentage of the construction activity in the gross value-added tabulations would be directly related to mining activities.

### Investment and New Projects

Each year the Australian Bureau of Agricultural and Resource Economics (ABARE) publish a *Minerals and Energy Major Development Projects* listing which outlines major project development activity together with project development proposals.<sup>10</sup> The most recent data indicate yearly expenditure on minerals and energy exploration in Australia of \$5.5 billion. Investment in mineral exploration underpins the ability of Australia's mineral and energy industries to grow and expand its contribution to national economic performance over the medium to longer term.

In the six months to April 2010, 20 major minerals and energy projects with a capital expenditure of \$11.4 billion were completed. A further 34 projects were at an advanced stage with completion expected by end 2010.

The largest petroleum project by capital expenditure is the Gorgon LNG project, which is owned by a joint venture consisting of Chevron, Shell and Exxon Mobil. The 15 million tonne LNG development received final investment approval in September 2009 and is scheduled for completion by 2015.

10. M Lampard and commodity analysts, *Minerals and energy: major development projects – April 2010 listing*, Australian Bureau of Agricultural and Resource Economics, Canberra, May 2010, viewed 3 June 2010, [http://www.abare.gov.au/publications\\_html/energy/energy\\_10/ME10\\_Apr.pdf](http://www.abare.gov.au/publications_html/energy/energy_10/ME10_Apr.pdf)

With an estimated capital expenditure of \$43 billion, it is the largest resources (minerals, oil or natural gas) project ever to be undertaken in Australia.

## Rural and regional development

Since the days of Australia's first mineral discoveries in the 1840s, vast areas of Australia have been opened up by resource development. Towns, community facilities, transport and communications infrastructure including roads, ports, airports and railways have been built almost entirely by resource development. Examples include developments in north-west Queensland, the Pilbara, the North West Shelf, the eastern goldfields of Western Australia, the Kakadu and Tanami regions of the Northern Territory, the West Coast of Tasmania, the iron triangle and the Cooper Basin of South Australia, and the Broken Hill area of New South Wales. The prosperity of much of North and Central Queensland, the Hunter Valley and the Illawarra in New South Wales and the Latrobe Valley and Central Gippsland in Victoria is based on resource activities.<sup>11</sup> The development of Roxby Downs, the town established in association with the large copper-uranium-gold mine in South Australia in the late 1980s, is probably the last big town development.

In the last two decades, largely owing to the remoteness and scale of many modern mines and access to air transport, the emphasis of development has changed. In the past, much infrastructure development was an extension of publicly accessible road, rail, port and urban facilities; today much of the infrastructure is private (such as dedicated ports and rail), and increased use of "fly-in/fly-out" has reduced the development of new towns or expansion of existing towns in the mining regions. Fly-in/fly-out arrangements, whereby employees are working extended shifts for long periods away from families and places of residence are obviously more cost effective from the mine development point of view, but introduce a range of other social issues.

## Technological development and environmental research

Australian mining companies have long been at the forefront of technological development and environmental research. The technique of differential flotation enabling the separation of zinc and lead concentrate finds its way back to the early days of Broken Hill. Mount Isa Mines developed technology that enabled the growing of continuous copper cathode plate on reusable stainless steel cathodes and introduced new techniques in the copper smelting process with [Isasmelt Technology](#).<sup>12</sup>

Australian companies have been at the forefront of implementing technologies of scale in both coal and iron ore operations, driving down cost and improving productivity, important attributes to keep Australian mining operations cost competitive and suppliers of the world's mineral commodities.

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11. J Howard (Prime Minister) and W Parer (Minister for Resources and Energy), *Minerals & petroleum: resources policy statement: a framework for sustainable growth*, Australian Government, Canberra, 1998.

12. Xstrata Technology, 'About Isasmelt', viewed 3 June 2010, [http://www.isasmelt.com/downloads/20060111\\_about\\_isasmelt.pdf](http://www.isasmelt.com/downloads/20060111_about_isasmelt.pdf)

Australian companies are also major developers, users and exporters of computer software that is used to improve and increase the efficiency of mining operations.

The Minerals Council of Australia indicates that Australian mining companies are the largest employer of environmental scientists in the country. Environmental awareness is paramount both during, and at the completion of mining operations, to ensure the least environmental impact. The minerals sector spends in the order of \$200 million annually on rehabilitation of disturbed lands.<sup>13</sup>

## Emerging and ongoing issues

The most recent issue that has raised considerable interest and debate in the resources sector was the announcement in the 2010 Budget of the impending imposition of a Resources Super Profits Tax (SPRT) on the minerals industry. This proposed tax has been superseded with a newer and less onerous Minerals Resource Rent Tax (MRRT). Some other significant issues include climate change; infrastructure planning; sustainability; a range of environmental issues including human health, societal impact, post-mine management and local and landscape-scale degradation; indigenous involvement within the sector; value adding; competing land use and overseas ownership.

### Resource Tax Issues

The 2010 Federal Budget papers outlined the Government's intention to impose a Resources Super Profits Tax (RSPT) on Australian mining operations. The tax proposed was 40 per cent, as presently applies to oil and gas companies operating in Commonwealth jurisdiction offshore waters outside the three-mile nautical limit, excluding the North West Shelf permits and the Timor Gap Joint Development Zone. Whilst the overall rate was the same as that applying to the oil and gas sector, the uplift provisions were lower and as such more onerous. The Petroleum Resources Rent Tax (PRRT) was set at 40 per cent although the threshold to trigger the tax was set at the Australian Government bond rate plus an uplift of 15 per cent for exploration expenditure, and 5 per cent for development/production expenditure. The imposition of the PRRT was vigorously opposed by the oil and gas sector, but was introduced in the mid 1980s. It has not prevented the development of a number of large oil and gas developments on the North West Shelf over the last few decades.

Shortly after the leadership change from the Rudd to the Gillard Government it was announced that the RSPT proposal would be replaced with a proposed Minerals Resource Rent Tax (MRRT). This would apply only to mined iron ore and coal rather than to all minerals as under the RSPT. The major iron ore and coal producers, namely BHP Billiton, RioTinto and Xstrata indicated to the Gillard Government that this newer proposal was much less likely to impact on future investment decisions. However, smaller mining and oil companies have indicated significant opposition to the MRRT

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13. Minerals Council of Australia (MCA), *The Australian minerals industry and the Australian economy*, MCA, Canberra, March 2010, viewed 3 June 2010, [http://www.minerals.org.au/data/assets/pdf\\_file/0017/32804/Aus\\_min\\_industry\\_fact\\_sheet\\_March\\_2010.pdf](http://www.minerals.org.au/data/assets/pdf_file/0017/32804/Aus_min_industry_fact_sheet_March_2010.pdf)

proposal. With both schemes the Commonwealth indicated it intends to rebate lost royalty income to the States and Territories.

Whilst the concepts of resource rent taxes as applied to minerals, oil or natural gas have similarities, there are significant differences in the economics of mining and oil and gas production. The very profitable iron ore bulk mining operations of the major companies such as BHP Billiton and Rio Tinto together with a number of large coal producers differ in many respects from the smaller operations of the base metal miners. Mining is an inherently intensive operation involving mine development and ore extraction followed by processing to produce a mineral concentrate. In some cases this concentrate is exported for treatment overseas (eg McArthur River lead-zinc mine in the NT; Century zinc mine in NW Queensland). However, in most cases the concentrate then undergoes smelting on-site or nearby to produce metal ingot that is then shipped for final refining. In contrast, at oil or natural gas operations the hydrocarbon stream is fed directly to pipelines or storage and offloading facilities for transportation and subsequent refining remote from the wellheads.

## **Climate change**

The minerals, oil and natural gas industries are major greenhouse gas emitters. Whilst these industries have made contributions in reducing the impact from their operations in regards to lowering emissions with the incorporation of newer technologies, any industry involved in the production and use of hydrocarbons will remain a major emitter. These Australian industries have long argued that they operate in a world market and that if similar environmental operating conditions are not placed on all producers, then they will be at a competitive disadvantage. The Rudd Government's Carbon Pollution Reduction Scheme legislation did not proceed. As such, the requirement for the implementation of major emissions reduction measures has been deferred.

Climate change activists demand a wholesale move away from coal as Australia's main electricity generation source. While this is achievable in theory, the cost would be very substantial. In any case, coal is highly likely to remain the dominant feedstock globally for electricity generation for the foreseeable future, such that cessation of electricity generation from coal on Australia would have no significant impact on greenhouse gas emissions world-wide.

## **Infrastructure planning**

Much of the Australian resource sector infrastructure is straining under the load of increased output and ever increasing overseas demand. Many major infrastructure expansions and additions are planned. These include the building of new rail and road links, harbour expansions and associated loading facilities, together with expansions of the electricity and gas pipeline networks.

Infrastructure development to service the needs of the resources sector raises a number of planning issues such as:

- Will mining-specific major infrastructure be a sustainable and useful asset for the community in the long term?

- Compatibility/integration with national infrastructure. Will the level of short-term (ie mine life) and long term (ie post-mine) access be of benefit to the general community?
- Planning procedures and timelines for national, State and local authorities; and
- Appropriate cost-sharing between the industry and government for mine-related infrastructure.

## Sustainability

A wide range of mineral sector sustainability issues emerge from the views and analyses of various stakeholders in mineral, oil and natural gas development. Companies look to sustaining their operations (ie maximising their profitability timeline) and obtaining community acceptance. Attempts by companies to reconcile the diversity of views on sustainability issues have led to the recognition of the need to report on a triple bottom line of social, economic and environmental performance. Most Australian resources companies prepare and publish sustainability reports.

## Environmental performance

All mining operations are required to adhere to environmental protection requirements attached to their licences to operate, and all significant proposals are subjected to Environmental Impact Assessment by the regulatory authorities. The Commonwealth intervenes in this process where the proposal is considered to raise issues of National Environmental Significance. Many companies claim to follow 'best practice environmental management principles and practices' to achieve levels of performance in excess of legislated requirements. However, from time to time significant events occur which impact upon the environment, reflecting the complexity of mining operations. These events not only 'maintain the rage' amongst anti-mining groups, but also risk eroding general support for the industry and relationships between individual mining operators and their surrounding community.

Recent examples of environmental impacts in Australia include the Timor Sea drill rig fire and oil leak in 2009; lead and nickel water contamination and bird and fish deaths associated with dust from lead carbonate loading in the port of Esperance WA; and reductions in river flow and potential for contamination from gas bubbling along the Georges River south of Sydney, 2004, related to long-wall extraction of coal seams.

Ongoing matters of concern relate to long-term potential environmental impacts following mine closure, particularly regarding open voids, contaminated pit water, river and aquifer contamination, reduced options for land use, and the larger-scale landscape impacts will arise from iron ore mining in the Pilbara region. In 1997 the annual cost of managing acid drainage in operating mines was estimated at \$60 million; these costs escalate by a factor of 2 – 5 after mine closure, emphasising the requirement for effective management and control during the operational phase of mining.<sup>14</sup> An

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14. J Harries, *Acid mine drainage in Australia: Its extent and potential future liability*. Supervising Scientist Report 125, 1997, viewed 18 June 2010, <http://www.environment.gov.au/ssd/publications/ssr/125.html>

emerging issue related to in-situ gasification of coal seams (coal seam gas) is the potential for contamination and acidification of aquifers and surface waters.

## Health and safety

Australia is a world leader in mine safety, although the inherent risk to workers is very difficult to reduce to zero. Unlike the high death tolls resulting from mine collapse and mine fires in other countries (such as Chinese coal mine disasters), fatalities in Australia are low – the 2006 Beaconsfield gold mine incident in Tasmania resulted in one death; the Bronzewing gold mine collapse in WA in 2000 resulted in the deaths of three men.

The public is also at risk in terms of health impacts. Recent examples include elevated lead blood levels related to air pollution from metal smelting at Port Pirie (South Australia) and Mount Isa (Queensland), and cancer clusters in the Upper Hunter Valley NSW and their possible relationship with mine dust.

## Indigenous involvement

The historic 1992 *Mabo v Queensland (No 2)* High Court decision granted Australia's indigenous people legally responsible rights to land sourced in traditional laws and customs. The High Court held that

the common law of this country recognises a form of Native Title which, in the cases where it has not been extinguished, reflects the entitlements of indigenous inhabitants, in accordance with the laws and customs, to their traditional lands.<sup>15</sup>

The recognition of Native Title has now significantly enhanced the position of many indigenous communities in rural and regional Australia. These communities have become integral stakeholders in mineral and petroleum resource development. The use of indigenous land-use agreements (ILUAs) is now commonplace with indigenous groups and mining and exploration companies.

Most mining operations in remote Australia are required to have community development and involvement programs involving aboriginal people. These commonly require training and employment in the mine workforce, although employment goals are in places difficult to achieve and maintain given deep cultural differences and diversity in the level of support for mining within some indigenous communities.

## Value adding

Many commentators have long regarded Australia as a quarry – that is, a producer of low value bulk mineral commodities, such as coal, iron ore, bauxite and metallic mineral concentrates. However,

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15. *Mabo v Queensland (No 2)* ("Mabo case") [1992] HCA 23; (1992) 175 CLR 1 (3 June 1992), viewed 3 June 2010, <http://www.austlii.edu.au/au/cases/cth/HCA/1992/23.html>



there is a relatively high degree of minerals processing to the metal ingot stage as in other developed mineral producers such as Canada, USA and Sweden. The issue is more relevant to the downstream manufacturing industry, but there are significant hurdles. Firstly, the mines are commonly distant from industry centres capable of manufacturing more elaborately transformed goods; secondly Australia would face high input tariffs for such goods in many countries; and thirdly, it is not always straightforward in implementing newer technologies to upgrade raw materials. Both BHP Billiton and RioTinto have attempted large capital intensive projects to upgrade iron ore to the 'briquetted' iron stage without success.

## **Competing land uses**

Despite the fact that mineral endowment is spread throughout Australia, there are instances of proposed mineral, oil and natural gas development competing with alternative land use. Examples include coal developments in the Hunter Valley of New South Wales competing with farmland use and viticulture which leads to ongoing disagreement and conflict between interested parties. Mining is seen by the traditionally agriculturally-based community in this region as a relatively short-term land use which post-mining will render previously highly productive and valuable land useless for sustainable high-value agriculture. The pressures of gradual encroachment by coal mining, perceived impacts on surface and underground water supply and quality, and possible negative health impacts (in this case from 'mine dust') also result in social discontent and bring in to question the long-term viability of the region's traditionally agriculture-based community and economy.

In a similar vein, the rapid development of the coal seam methane industry in both Queensland and New South Wales has created concern for landholders in those areas. These concerns relate to high levels of drilling and development activity over farm land, and above-ground storage of salty water associated with gas developments.

All mines have requirements which demand site rehabilitation, but the aim is generally focussed on slope and surface stability, and containment or long term management of contaminants. Whilst post-closure requirements at minesites in closely settled areas may require rehabilitation to attain a result where the mined land is suitable for some level of subsequent land use, more remote projects such as those in rangeland or desert environments are generally less onerous, and do not require the land to be brought back to its previous or similar condition; there may not even be a requirement for the outcome to be suitable for any form of subsequent beneficial land use.

## **Overseas ownership**

Many of Australia's iconic mining companies are wholly or partly owned offshore. Mount Isa Mines, a silver, lead, zinc, copper and coal miner was purchased outright by Xstrata, an international Swiss company, in 2003. CRA, a large multi-commodity Australian exploration and mining company was absorbed wholly into Rio Tinto in 1995. BHP Billiton is still largely managed from Australia, but nearly two thirds of its ownership is offshore. The well known and highly successful Australian explorer and miner, Western Mining Corporation was acquired by BHP Billiton in 2005. Furthermore, major stakes

in mining, smelting and refining operations have been acquired by overseas companies, an example being a 20 per cent stake in Queensland Alumina Limited by Rusal, a Russian company and the world's biggest aluminium producer. With increasing levels of overseas ownership and management, there is a risk that less regard for the Australian economy and community will be made in the setting of the company's international objectives and priorities.

## Concluding comments

The Australian resources sector plays a vital role in the Australian economy. The minerals industry is among the top five producers of the world's key mineral commodities. Additionally, Australia is the world's largest exporter of black coal, iron ore, alumina, lead and zinc and the second largest exporter of uranium.

While Australia's crude oil production is dropping, and further declines are expected over the next decade, Australia fortunately has ample resources of natural gas. The bulk of Australia's natural gas resources are located offshore in north western and northern Australia, and coal bed methane gas resources associated with the extensive coal deposits of Queensland and New South Wales are playing an increasingly important role in supplying natural gas to Eastern Australia.

The resources sector is the largest contributor to merchandise exports, a major contributor to GDP, a major employer, a major contributor to government revenue and investment. Other benefits such as its contribution to rural and regional development and technological development and environmental research are also significant.

There are a number of emerging and ongoing issues affecting the resources sector. These include the Government's intention to impose a Resource Super Profits Tax on Australian mining operations (now reverted to a Minerals Resource Rent Tax on mined iron ore and coal only); the impact of greenhouse gas abatement strategies in response to climate change; infrastructure bottlenecks restraining increased output and ever increasing overseas demand for mineral commodities; sustainability; a range of environmental issues; indigenous involvement in the sector; value adding; and overseas ownership.

Strong growth in demand for and price of commodities has given rise to a minerals and gas boom which, given predictions for continued growth in China and India, appears to be here for the longer term. The resources sector is profiting handsomely from this boom. The question needs to be resolved as to what level the industry should share its profits with the Australian community to pay for the right to extract finite resources whose ownership is invested in the community; to contribute to building community infrastructure and wealth for the nation beyond the immediate needs of the resources sector; and to offset (or pay for mitigation of) the various impacts of mining that accrue on the land and the community in both the short and long term.

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