Australia’s mineral endowment, recent discoveries and investment opportunities

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## Australia’s Mineral Production and Endowment

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Production Rank</th>
<th>Resource Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bauxite</td>
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<tr>
<td>Black Coal</td>
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<td>6</td>
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<tr>
<td>Copper</td>
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<tr>
<td>Diamonds</td>
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<td></td>
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<tr>
<td>Gold</td>
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<td>2</td>
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<tr>
<td>Iron Ore</td>
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<td>4</td>
</tr>
<tr>
<td>Lead</td>
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<td>1</td>
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<tr>
<td>Manganese Ore</td>
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<td>4</td>
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<tr>
<td>Nickel</td>
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<td>1</td>
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<tr>
<td>Rutile</td>
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<td>1</td>
</tr>
<tr>
<td>Silver</td>
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<td>2</td>
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<tr>
<td>Tantalum</td>
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<td>1</td>
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<tr>
<td>Uranium</td>
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<tr>
<td>Zinc</td>
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<tr>
<td>Zircon</td>
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<td>1</td>
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</table>
Australia’s Mineral Industry
Built on a Strong Resource Base

• Japan is a long-standing major market for Australian resources

• Recent expansion in capacity
  – more than 20 mining projects completed in 2008
  – ~27 mining projects to be commissioned in 2009 (ABARE)

• Australia’s diversified mineral exports underpinned by a strong resources base

• Exploration has maintained and grown resources despite substantial increases in production

• Exploration opportunities with high potential for new discoveries in greenfields and brownfields provinces
New Mining Projects Under Development

Mineral Development
- Base Metals
- Black Coal
- Iron Ore
- Gold
- Copper - Gold
- Nickel
- Mineral Sands
- Uranium
- Rare Earths
- Vanadium

Australia-Japan Mining Investment Seminar, Tokyo, 24 February 2009
Iron Ore

- Australia has ~13% of world’s EDR of iron ore
- Australia produces ~16% world’s iron ore (3rd in world)
- Exports in 2008 = 306 Mt, major seaborne trade
- Major expansion - new mines, rail and port in Pilbara
  - BHPB’s RGP4 (2010) increase to 155 Mtpa, RGP5 (2011) to 200 Mtpa
  - Pilbara Iron (FMG) 45 Mtpa
- Advanced stage projects in mid-west WA & SA
Iron Ore Resources and Exploration

- Record level of exploration
- Over 500 projects (~60% at grassroots/early exploration) – WA (94%), SA, NT, Tas

- New exploration results
  - Serenity 1.01 Bt @ 56% Fe
  - Solomon 702 Mt @ 55.9% Fe
  - Railway 111.3 Mt @ 57.7% Fe (incl 84.5 Mt @ 60% Fe DSO)
  - Wilgerup 13.2 Mt @ 57.7% Fe (ind), 0.75 Mt @ 56% Fe (inf)

- Active exploration for
  - Hematite
  - Hematite-goethite
  - Channel Iron Deposits
  - Detrital Hematite
  - Magnetite
Copper Resources and Exploration

- Australia has 12% of world Cu EDR (2nd largest)
- Produces ~6% of world’s copper (5th in world)
- Exports in 2008 = 1.69 Mt
- High level of exploration
- Some 1400 projects ~ 36% at grassroots stage

- Strong interest in IOCG deposits (SA, Qld)
  - Prominent Hill resource (2.5 Mt Cu, 7.4 Moz Au)
  - Carrapateena (900m @ 2.1% Cu, 1.0 g/t Au)
  - Cloncurry-Swan-Mt Elliott (3.1 Mt Cu, 5.1 Moz Au) with Mt Elliott = 280 Mt @ 0.6% Cu, 0.4 g/t Au

- Porphyry Au-Cu deposits
  - Cadia (5.5 Mt Cu, 39 Moz Au)
Australia-Japan Mining Investment Seminar, Tokyo, 24 February 2009

Copper Resources and Exploration

Copper Hill
- 0.42 Mt Cu, 1.2 Mozs Au

Mt Elliott
- 2.32 Mt Cu

Mt Dore
- 0.48 Mt Cu

Starra Line
- 0.274 Mt Cu

Rocklands
- 103m @ 4.38% Cu

Carrapateena

Map of Australia showing copper resources and exploration areas. Details of copper resources at various locations are marked on the map.
Zinc-Lead

- Australia has 24% of world Zn and 30% of world Pb EDR (ranked 1 for both)
- Exports in 2008 ~2.2 Mt Zn and 0.31 Mt Pb (ores and concentrates)
- Angus mine (SA) commissioned 2008
- Cutback in production and mine closures due to low price of Zn
- No new Zn development projects but number at advanced exploration and feasibility
- Recent Chinese investment in Broken Hill

Source: Intierra
Zinc-Lead Resources
Uranium

- Australia has ~38% of world’s U recoverable at <US$80/kg
- Three operating mines (Ranger, Olympic Dam, Beverley)
- 2008 production = 8,430 t U₃O₈, ~20% of world, 2nd after Canada
- New ISR mine at Honeymoon in 2010 (Mitsui 45%)
- New projects at feasibility - Oban ISR (2009), Crocker Well (2010), Four Mile (2010), Nolan’s Bore (REE-P-U - 2011), Yeelirrie (?)
- Record exploration in 2007-08
- Renewed interest in calcrete U (WA) as well as sandstone U deposits
- Significant number of projects at advanced exploration stage
Reasonably Assured Resources
Top 10 uranium resource countries

Australia
Kazakhstan
USA
Canada
South Africa
Niger
Namibia
Russian Federation
Brazil
Ukraine

U resources (’000 tonnes)

US$ 80-130/kgU
<US$ 80/kgU
Uranium resources - mines and deposits
In total, over 90 known uranium deposits

Uranium Resources
as reported by companies

Mineral Resources
Cle Reserves
Resource Range (t U3O8)
0 - 3,000
3,001 - 10,000
10,001 - 50,000
50,001 - 1,000,000
> 1,000,000

Australia Government
Geoscience Australia

Uranium Resources
June 2008

Scale
0 125 250 500 750 1000
Kilometers
No significant Quartz pebble conglomerate type U-Au deposits known.
**Tungsten**

- Significant past production (King Island)
- Recent exploration (post 2004) – EDR now ~ 87 kt
- Advanced stage projects
  - Wolfram Camp operations suspended 2008 – 948 kt @ 0.413% WO₃
  - King Island Scheelite mine (feasibility) – Chinese JV - Output ~ 3kt WO₃ conc. pa
  - Molyhil (3.73 Mt @ 0.345% WO₃, 0.17% MoS₂) – finance 1.38kt W, 0.39 kt Mo pa
  - Watershed (15.1 Mt @ 0.46% WO₃) – feasibility 1.18 kt WO₃ conc. pa

*Source: Intierra*
**Rare Earth Resources and Exploration**

- **Australia has ~ 52 Mt REO identified resources**
  - Significant uneconomic resources (Olympic Dam, mineral sands (monazite))
- **Mt Weld (Mine)**
  - 20 kt REO pa (processing in Malaysia)
  - 12.24 Mt @ 9.7% REO
- **Nolan’s Bore (feasibility)**
  - 30.3Mt @ 2.8% REO, 12.9% P₂O₅, 0.44 lb/t U₃O₈
- **Other REO in regolith-enriched carbonatite and alkaline rocks (Dubbo, Cummins Range)**

![Mt Weld, Lynas Corp.](image)

Only 14% of projects have resources

Source: Intierra
Molybdenum

- Australia has 198 kt Mo EDR
- Production in 2008 from Wolfram Camp (W-Mo)
- New Projects
  - Spinifex Ridge 2010, 10.9 kt Mo, 12.3 kt Cu pa (concentrates)
  - 1.05 Bt @ 0.074% Cu, 0.041% Mo incl. 451 Mt @ 0.05% Mo, 0.08% Cu
- Advanced Projects
  - Molyhil – finance 1.38 kt W, 0.39 kt Mo pa
  - Anduramba – feasibility 950 t Mo, 300,000 oz Au, 0.14 kt Cu
  - Kingsgate – feasibility 0.45 kt MoO₃, 0.3 kt Bi, 50-80,000 oz Au
- New discoveries
  - Mt Dore (Merlin) - e.g. 67m @ 1.28% Mo, 29.2g/t Re, 0.13% Cu

14% of projects have resources
Source: Intierra
Australia has 1.5 Mt Co EDR – large inferred resource in Ni laterite

Production 2008 = ~5,000 t Co mostly as by-product of Ni, other deposits e.g. Browns Co-Cu-Ni-Pb deposit.

Ni laterite ores ~ 0.05-0.10% Co

Co-bearing Ni laterite projects at (pre-) feasibility

- Gladstone
- Kalgoorlie
- NiWest heap leach
- Nornico
- Wingellina
- Yerilla

First national inventory of cobalt resources was 1985

42% of projects have resources

Source: Intierra
Co Projects in relation to Nickel Resources

- Wingellina: 40 kt Ni, 3.5 kt Co pa
- 183 Mt @ 0.98% Ni, 0.076% Co

- NiWest: laterite
- 30-35 kt Ni, 0.63 kt Co

- Kalgoorlie: 50 kt Ni, 3 kt Co

- Gladstone: 63 kt Ni, 6.2 kt Co

- Young: 280 Mt @ 0.58% Ni, 0.06% Co

- Nornico: 10 kt Ni, 0.435 kt Co
Australia has 19 t EDR PGM

Total PGM resource ~ 220t (mostly inferred)

Mine production 2007 = 0.742 t from Ni mines in WA (by-product from Ni)

Advanced Exploration Projects (feasibility)

- Panton Sill (on hold)
  14.3 Mt @ 5.2 g/t PGM incl. 2.2 g/t Pt, 2.4 g/t Pd
  (35-50 000 oz pa)
Interactive Mapping

Create a map showing Australia's mines. You can use the Quick Search tool to locate a mine by name, or for more in-depth research, the Advanced Search tool has a wider selection of search options. The mapping application also allows you to view points in Google Earth and print maps in PDF format.

- Create a Map
- Quick Search
- Advanced Search

History of the Minerals Industry

View a history of the minerals industry in Australia in Google Earth and read about its role in Australia's economic development.

- History of the Minerals Industry in Australia

Information about Mineral Resources

Read in-depth information about Gold, Bauxite, Iron Ore, Copper and other major mineral commodities in the annual Australia's Identified Mineral Resources report.

View Fact Sheets and Rock Files about some of Australia's key metals and minerals in our Education section. Also available is Minerals Dow under - a student resource with information about Gold, Copper, Silver, Mineral Sands and Iron, as well as interactive quizzes.

- Australia's Identified Mineral Resources
- Mineral Fact Sheets
- Mineral Rock Files
- Minerals Dow under
- Geoprospective-Scale Assessment of Mineral Potential
Australia’s Exploration Potential

- Australia has very large mineral endowment
- Opportunities for further discoveries
  - For deep deposits in known mineral provinces
  - Under regolith and shallow sedimentary cover
    - large areas of prospective ground with only thin cover
  - Frontier terranes where mineralisation can still be found in outcrop
- Diversity of commodities, mineralisation styles, terranes
- Joint Ventures available, grassroots exploration
Government Geoscience Programs To Reduce Exploration Risk

- Government assistance including advice and pre-competitive geoscience information
- New generation regional datasets
  - geophysics, geology, geochemistry
- New geophysical surveys
- On-line geoscience information
  - Geoscience portal
  - Download geophysics
- 3D geological models of mineral province based on deep crustal seismic surveys
- Access to open file company reports
- Improved target selection and reduced risk for explorers
Summary

- Australia is a major supplier of resources to the world
- Australia has a world-class resource base
- Resource base maintained and grown despite major increase in production by continued discovery
- Rich, diverse mineral endowment
- Highly prospective provinces
- Exploration generated large number of projects
- New discoveries and exploration results
- Government programs are reducing risks for explorers
- Leading-edge science supporting exploration
- Australia will continue to be a major supplier of resources
For more information

www.ga.gov.au

• Atlas of Australian minerals resources, mines and processing centres

• Australia’s Identified Mineral Resources

• Resource maps by commodity

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