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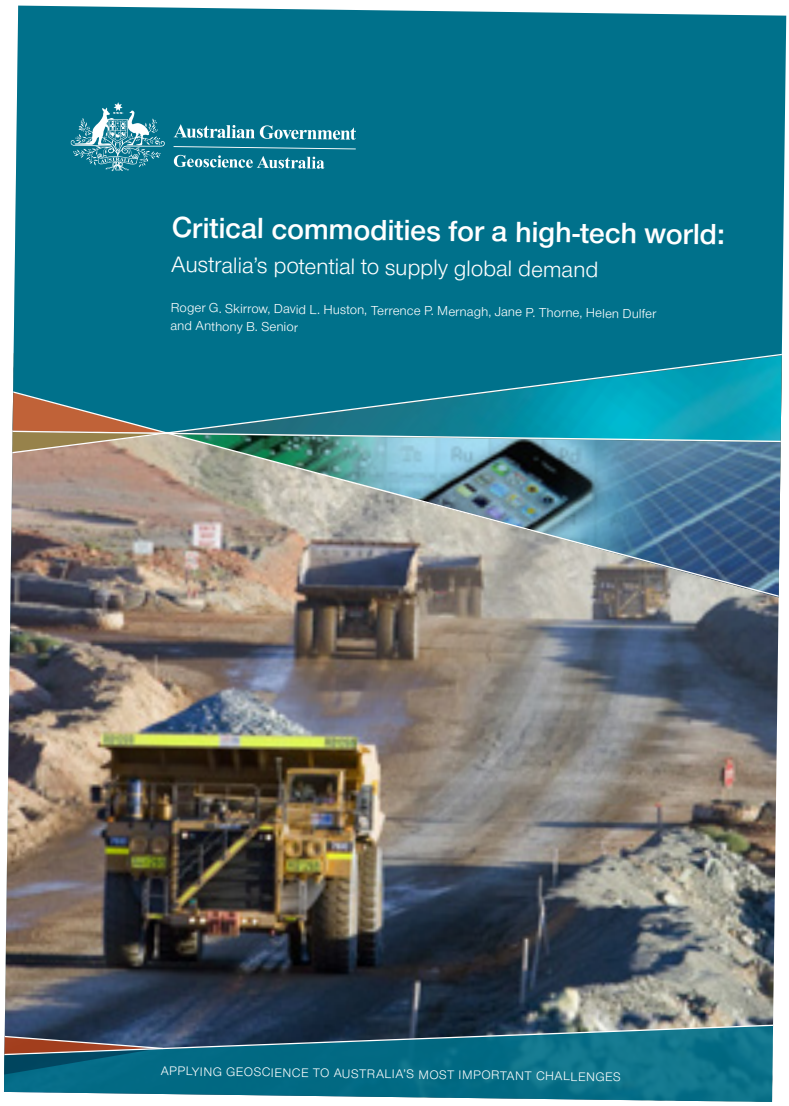
Critical commodities for a high-tech world



Geoscience Australia has released a report on *Critical commodities for a high-tech world: Australia's potential to supply global demand*. Critical commodities are metals, non-metals and minerals which are considered vital for the economic well-being of the world's major and emerging economies. However, they may be at risk of supply because of geological scarcity and other factors such as trade policies or political instability. Among these important commodities are metals and semi-metals used in the manufacture of mobile phones, flat screen monitors, wind turbines, electric cars, solar panels and many other high-tech applications.

Australia has abundant known resources of many of the critical commodities as well as major commodities such as iron ore, coal, gold, bauxite, copper, zinc, lead, etc. The report presents an evaluation of Australia's opportunities to supply critical commodities to world markets. For each of 34 commodities the level of resource potential in Australia is assessed on:

- The level of criticality
- Australia's known resources and potential for discovery of new resources
- Demand in terms of global market size
- Growth outlook.

Commodities assessed as having category one (high) resource potential in Australia are chromium, cobalt, copper, nickel, platinum-group elements (PGE), rare-earth elements (REE) and zirconium. This assessment does not consider non-critical commodities such as ferrous metals, most base metals and energy commodities. Australia has category one resource potential in many of these non-critical commodities.

Commodities assessed as having category two resource potential in Australia are antimony, beryllium, bismuth, graphite, helium, indium, lithium, manganese, molybdenum, niobium, tantalum, thorium, tin, titanium and tungsten.

Some of the category one and category two metals and semi-metals (antimony, indium), as well as gallium, germanium, cadmium, tellurium and selenium, are primarily by-products from refining the major commodities zinc, copper, lead, gold, aluminium and nickel. Australia's high global ranking in resources of all these major commodities implies that there is significant potential for new, or increased production, of the

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minor-element by-products listed above. Where recovery is currently uneconomic, opportunities may exist for improvements in mineral processing of ores to extract critical commodities as by-products.

Part 1 of the report presents an overview of the definition and uses of critical commodities and a summary listing of the commodities considered to be critical by the European Union, Japan, Republic of Korea, United Kingdom and United States of America. It also contains an evaluation of the opportunities and resource potential of critical commodities in Australia.

Part 2 is a technical description of the geological settings in which critical metals, non-metals and minerals occur along with their occurrence and known resources in Australia. This section is presented within a mineral systems framework which groups particular mineral deposit types according to their broad geological settings and processes of formation. Importantly, some inferences are also presented on the potential for undiscovered resources of many of the critical commodities in Australia.

The report also includes an extensive Appendix with summaries for each of the 34 commodities, including their characteristics and uses as well as supply data with global and Australian resources and production, and global demand data based on country import values.

A key conclusion of the study is that most of the critical commodities can be grouped into three families of mineral systems. They are:

- Mineral system family (1): Mafic-ultramafic-related nickel, PGE, chromium and cobalt—The occurrence of these commodities is closely associated with mafic-ultramafic igneous intrusions and lavas. Based on known resources in Australia, the continent appears to be under-represented in world-class intrusion-hosted nickel, PGE and chromium deposits, despite Australia's favourable geology for such deposits.
- Mineral system family (2): Felsic igneous-related REE, tungsten, niobium, tantalum, molybdenum, beryllium, tin and bismuth—All of these metals occur (albeit not exclusively) in association with felsic igneous intrusions, in particular with either highly-fractionated granitic rocks and/or with alkaline igneous rocks. Australia's potential for such deposits is considerable but has not yet been fully assessed.
- Mineral system family (3): Heavy mineral sand-hosted zirconium, titanium, REE and thorium—Recent discoveries of new heavy mineral sand provinces in Australia attest to the potential of the continent for further delineation of major resources of heavy mineral sands.

For more information

email ausgeomail@ga.gov.au

Related articles and websites

Critical commodities for a high-tech world: Australia's potential to supply global demand.
https://www.ga.gov.au/products/servlet/controller?event=GEOCAT_DETAILS&catno=76526

Australia's foundations revealed in a new atlas

Resource explorers, mining companies, researchers and the public will have improved opportunities to more closely investigate what geological structures lie beneath Australia with the release of an atlas of Australia's deep seismic reflection profiles.

In a joint venture between Geoscience Australia and the Australian National University, images of seismic reflection data that were collected over more than 30 years have been compiled into a single publication.

The data have been obtained in six Australian States and the Northern Territory using explosives and, more recently, Vibroseis vibrator trucks.

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Equipment on these vehicles transmits sound waves into the Earth, some of which are reflected back to the surface from deep structures or major rock boundaries. It is these structures and boundaries that are imaged, with the Moho, or Mohorovicic discontinuity, which is the geophysical boundary between the Earth's crust and the mantle, being one of the most striking.

The compilation includes a number of large-scale reflection transect groups of 1000 kilometres or more that link across major geological provinces and an extensive bibliography of reports and relevant publications.

The reflection profiles cover many different geological environments. The profiles are at 1:1 a horizontal to vertical scale and are accompanied by a geological strip map showing the configuration of the profile and its relation to other nearby seismic lines. The seismic images also provide an insight into many areas with little surface rock.

The atlas has been published as part of the UNCOVER initiative launched by the then Minister for Resources and Energy, the Hon. Martin Ferguson AM MP, which identifies that improved information about the sub-surface is a prerequisite for extending exploration in Australia into area with sedimentary cover.

Geoscience Australia's predecessor, the Bureau of Mineral Resources, started experimental seismic reflection probing in the late 1950s and expanded this work during the 1960s to 1980s with major profiling undertaken in southern Queensland. The atlas presents sections from the earliest phase of digital recording, which was first used in 1976.

Until 1998 the reflection acquisition in some sections achieved very good results but other surveys were of lower quality. Since the late 1990s however, all data have been acquired with a Vibroseis source which has led to a dramatic improvement in signal to noise, which, in turn, has resulted in a much better image.

With the aid of the research facility Australian National Seismic Imaging Resource (ANSIR) , AuScope and the pmd*CRC , Geoscience Australia in association with the States and the Northern Territory and industry partners obtained more than 12 000 kilometres of reflection profiles in six geographic regions.

The Deep Crustal Seismic Reflection Profiling Australia 1978–2011 is available from ANU E Press as a free download.

Data associated with the atlas is available through Geoscience Australia's Seismic Acquisition and Processing Project.

For more information

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Related articles and websites

Geoscience Australia's Seismic Acquisition and Processing Project
http://epress.anu.edu.au/titles/deep-crustal-seismic-reflection-profiling