



Australian Government
Geoscience Australia



Making Australia competitive: undercover mineral discovery

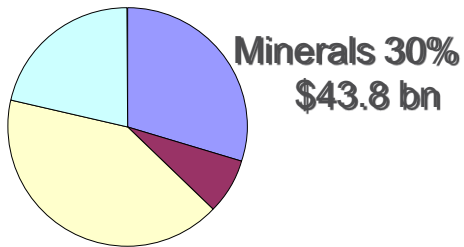
Dr Chris Pigram
Chief Executive Officer, Geoscience Australia



Australian economy and resource demand

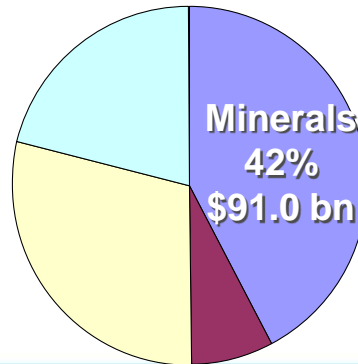


2002-03 total exports
\$147 bn

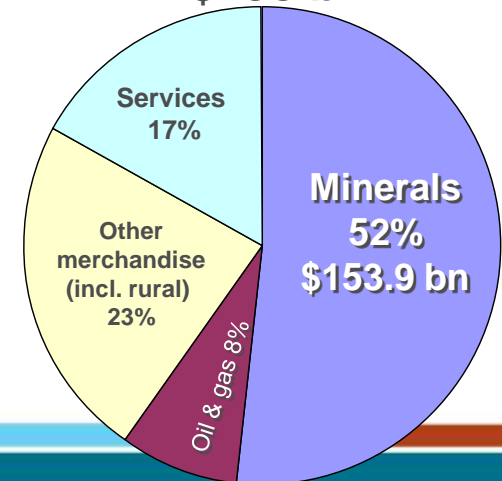


Source: ABS

2006-07 total exports
\$215 bn



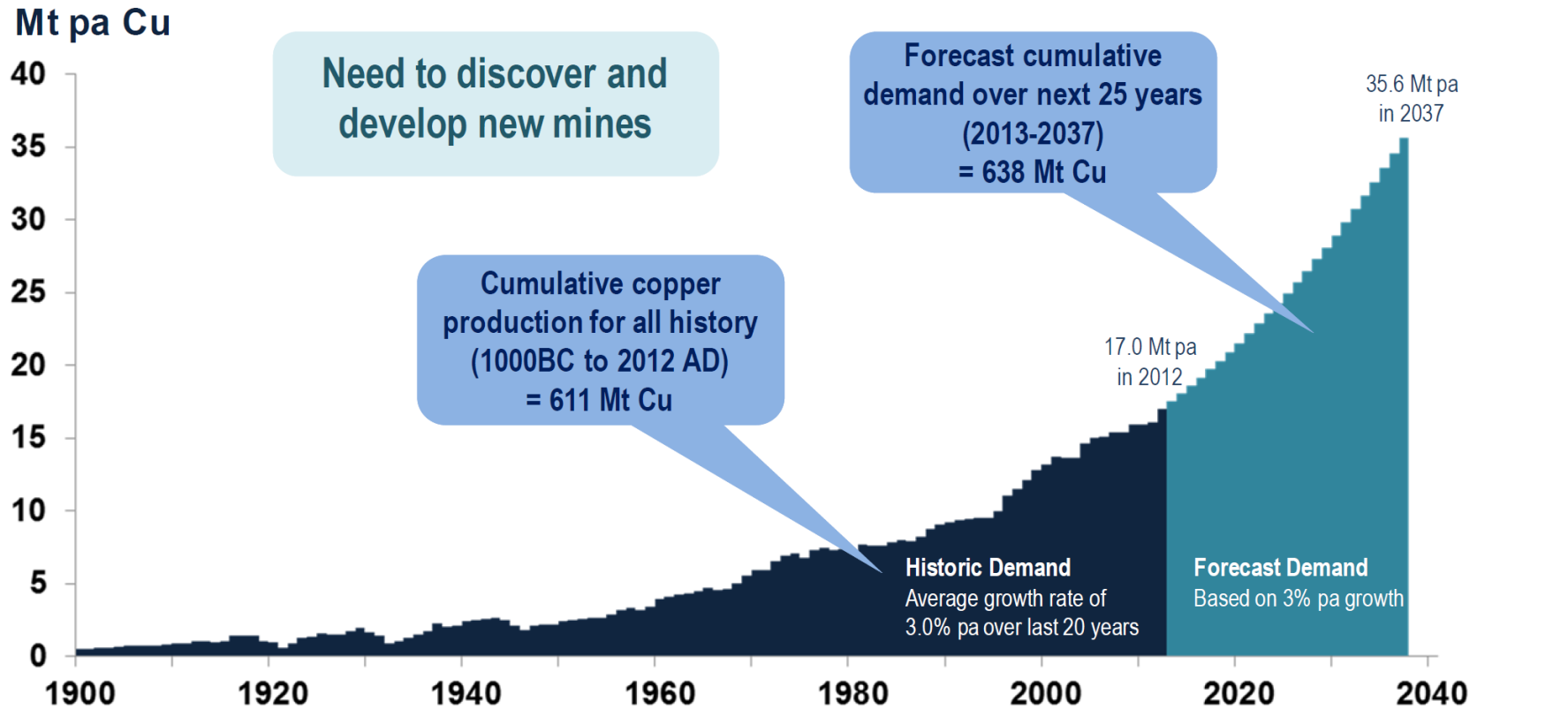
2010-11 total exports
\$298 bn



Metal demand increasing: source of supply??

World's metal production doubles every 20-25 years

Primary copper production: 1900-2040



R Schodde Minex Consulting

Australia's mineral potential large


Australia's inventory of metals and other elements

 **Gases or artificially produced**

 **Production, resources and exploration**

 **Resources (demonstrated and inferred) and exploration**

 **Exploration**

 **High criticality**

Hydrogen H																	Helium He				
Lithium Li	Beryllium Be															Boron B	Carbon C	Nitrogen N	Oxygen O	Fluorine F	Neon Ne
Sodium Na	Magnesium Mg															Aluminium Al	Silicon Si	Phosphorus P	Sulfur S	Chlorine Cl	Argon Ar
Potassium K	Calcium Ca	Scandium Sc	Titanium Ti	Vanadium V	Chromium Cr	Manganese Mn	Iron Fe	Cobalt Co	Nickel Ni	Copper Cu	Zinc Zn	Gallium Ga	Germanium Ge	Arsenic As	Selenium Se	Bromine Br	Krypton Kr				
Rubidium Rb	Strontium Sr	Yttrium Y	Zirconium Zr	Niobium Nb	Molybdenum Mo	Technetium Tc	Ruthenium Ru	Rhodium Rh	Palladium Pd	Silver Ag	Cadmium Cd	Indium In	Tin Sn	Antimony Sb	Tellurium Te	Iodine I	Xenon Xe				
Cesium Cs	Barium Ba	57-71 *	Lutetium Lu	Hafnium Hf	Tantalum Ta	Tungsten W	Rhenium Re	Osmium Os	Iridium Ir	Platinum Pt	Gold Au	Mercury Hg	Thallium Tl	Lead Pb	Bismuth Bi	Polonium Po	Astatine At	Radon Rn			
Francium Fr	Radium Ra	89-103 **	Lanthanum La	Lanthanum Lr	Rutherfordium Rf	Dubnium Db	Seaborgium Sg	Bohrium Bh	Hassium Hs	Mtnerium Mt	Ununnilium Uun	Unununium Uuu	Ununbium Uub	Ununquadium Uuq							
		*	Lanthanum La	Cerium Ce	Praseodymium Pr	Neodymium Nd	Promethium Pm	Samarium Sm	Europium Eu	Gadolinium Gd	Terbium Tb	Dysprosium Dy	Holmium Ho	Erbium Er	Thulium Tm	Ytterbium Yb					
		**	Actinium Ac	Thorium Th	Protactinium Pa	Uranium U	Neptunium Np	Plutonium Pu	Americium Am	Curium Cm	Berkelium Bk	Californium Cf	Einsteinium Es	Fermium Fm	Mendelevium Md	Nobelium No					

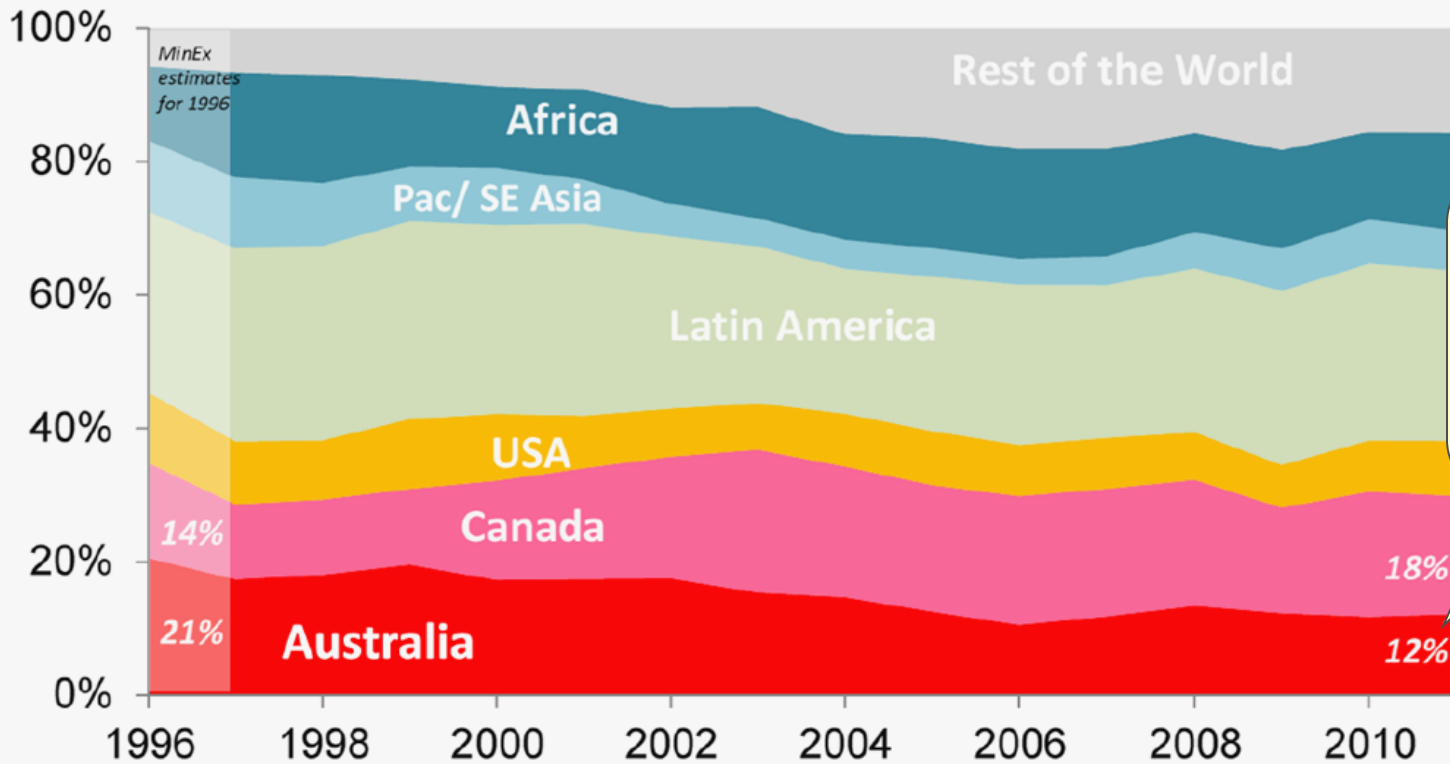
13-7409-8

Australia: the opportunity

- One nation – one continent
- Federated government system
 - Geoscience Australia (GA)
 - State and Northern Territory Geological Surveys
- Supportive governments at Federal and State level
- Skilled workers with deep knowledge of the continent's geology (e.g., GA, Surveys, Unis/CSIRO, Industry, service providers = UNCOVER)
- Arguably the best mapped (geological and geophysical) continent on the planet
- Proven producer of minerals to the world since the 1840s – prospectivity is very high
- Mature governance and legal system – sovereign risk is low
- **So what is the challenge?**

World exploration expenditures

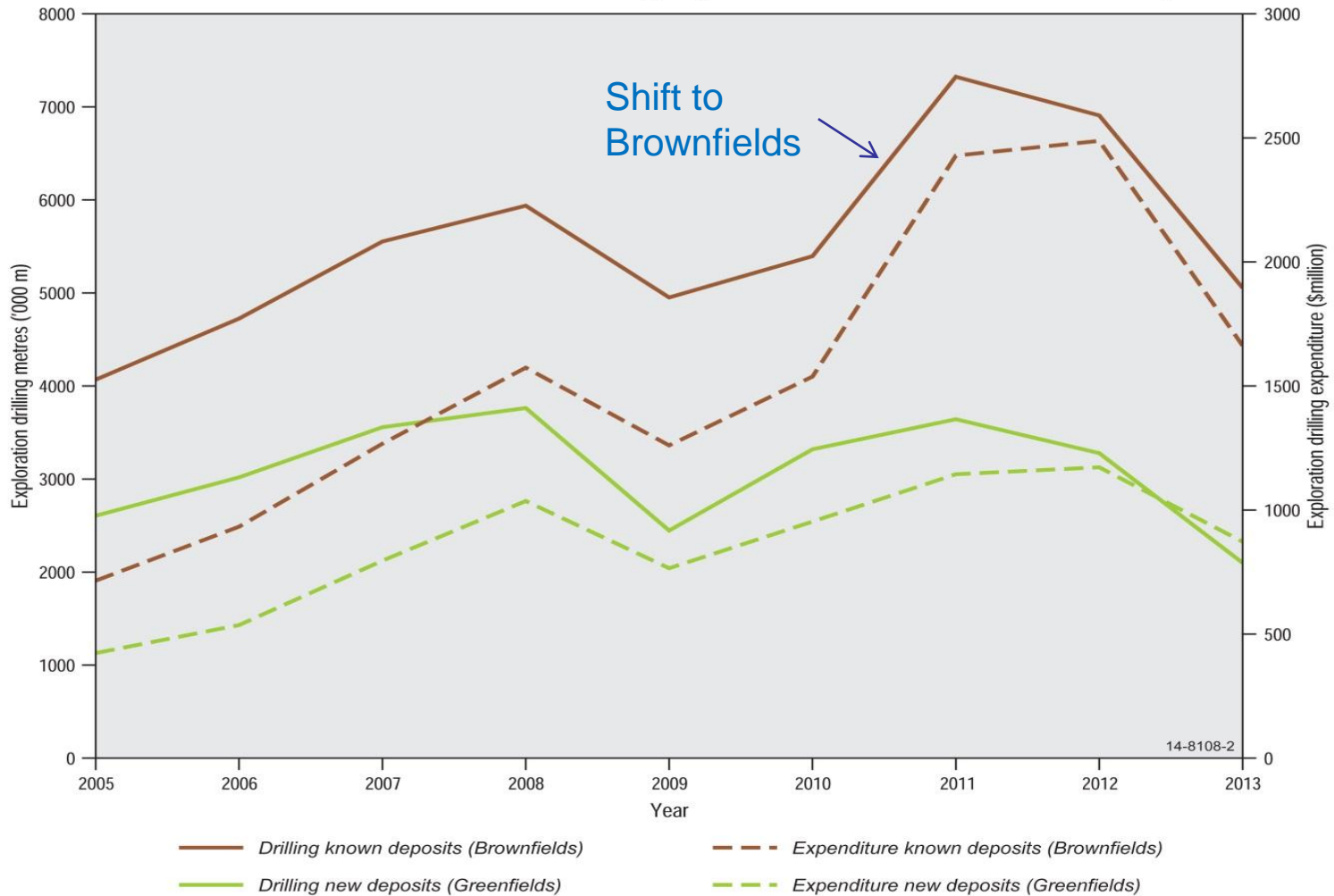
Percentage of Total Spend



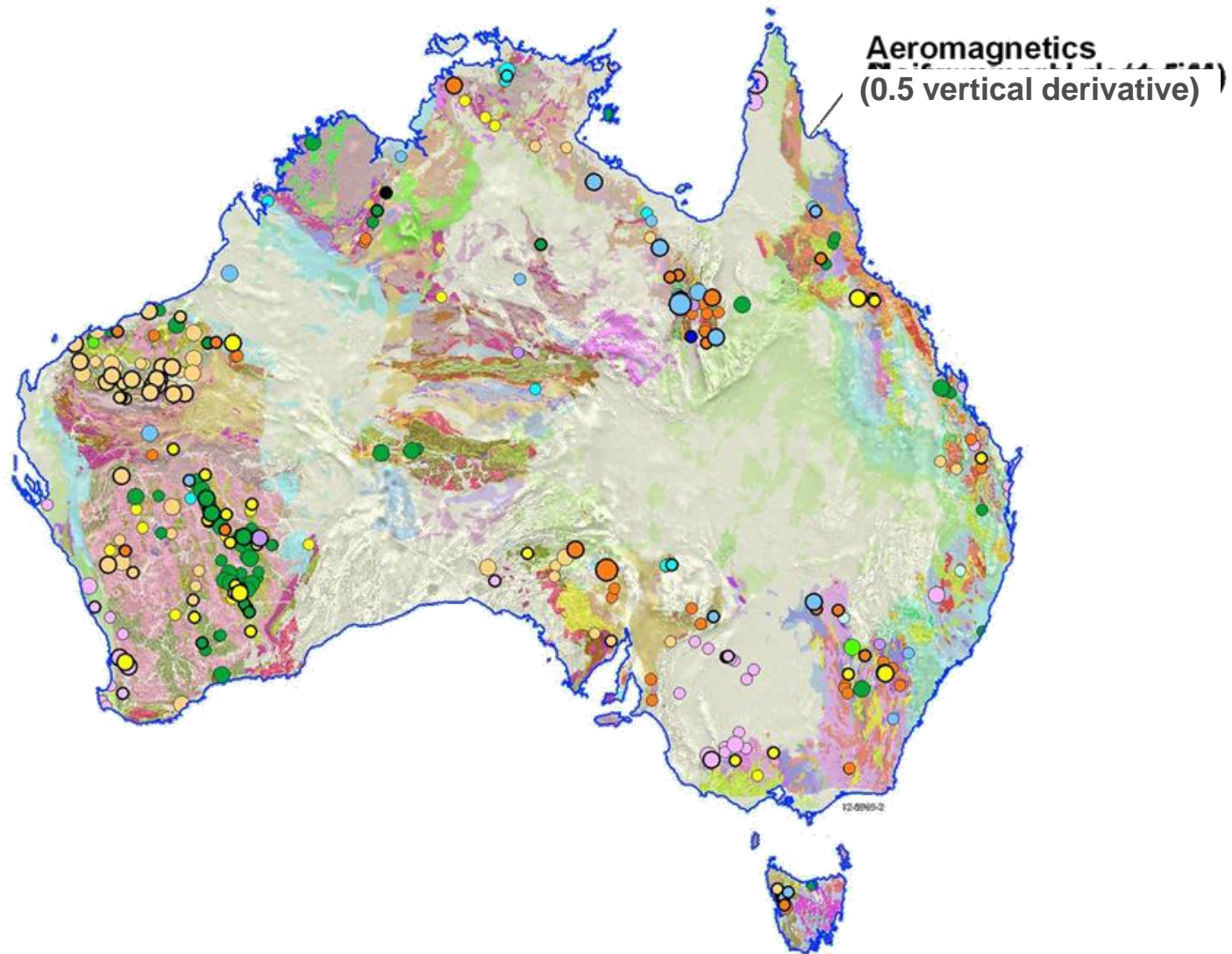
Australia's share has dropped from 21% to 12% since 1996

Sources: MEG and Corporate Exploration Strategies, 2012

Chart 2: Greenfields and brownfields drilling expenditure and metres - Calendar year series

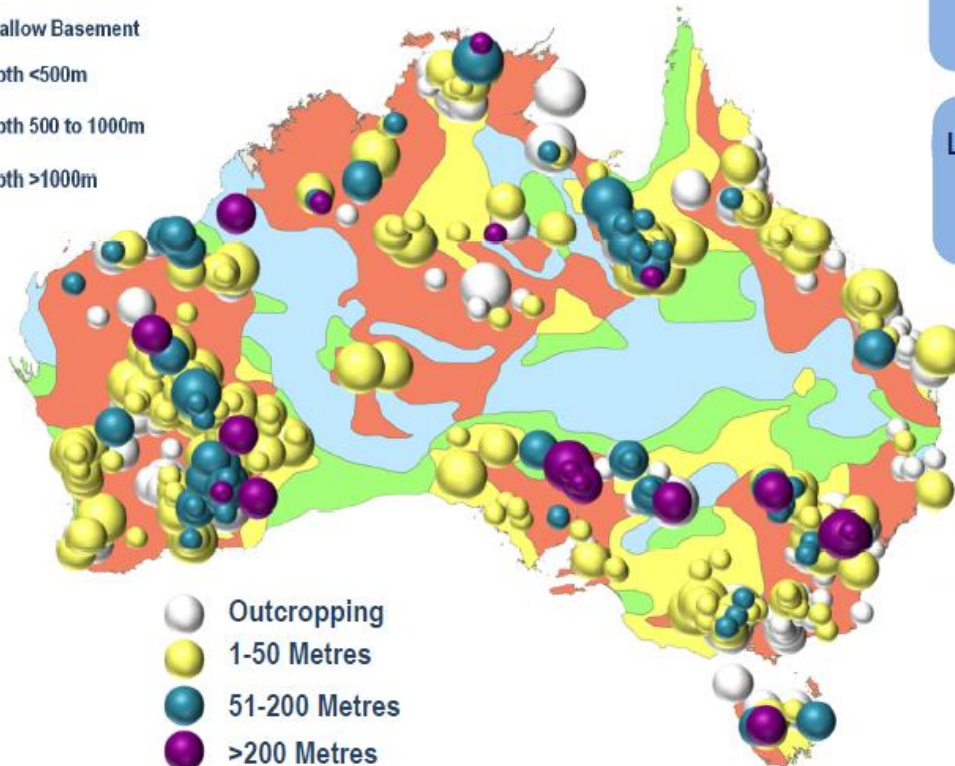
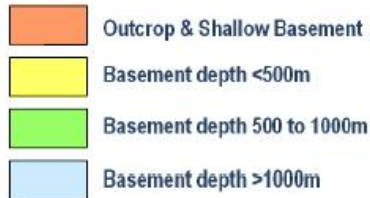


Australia's undercover mineral potential



Significant mineral deposits > 200 m

INDICATIVE DEPTH OF COVER



Most of the deep discoveries are in established districts

Large areas of Australia have not yet been explored effectively

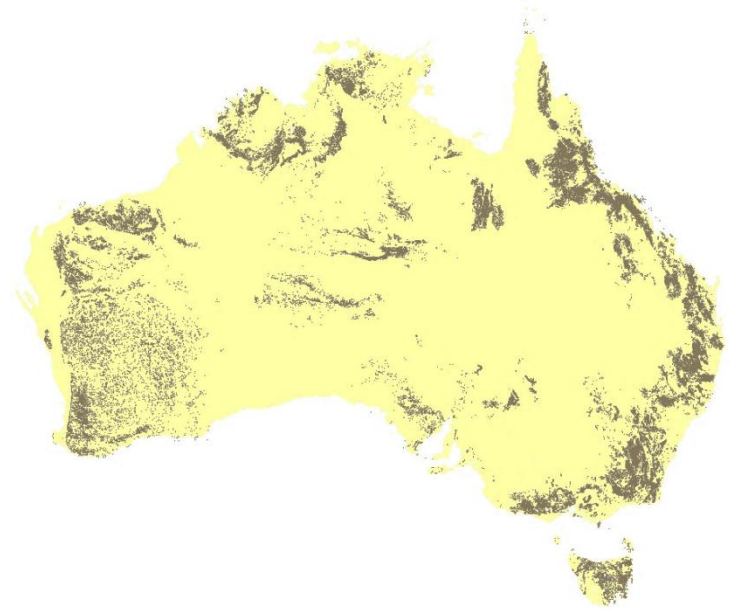
After Schodde, 2013

Note: Bubble-size refers to size of deposit
 "Moderate" >100koz Au, >10kt Ni, >100Kt Cu equiv, 250kt Zn+Pb, >5kt U₃O₈
 "Major" >1Moz Au, >100kt Ni, >1Mt Cu equiv, 2.5Mt Zn+Pb, >25kt U₃O₈
 "Giant" >6Moz Au, >1Mt Ni, >5Mt Cu equiv, 12Mt Zn+Pb, >125kt U₃O₈

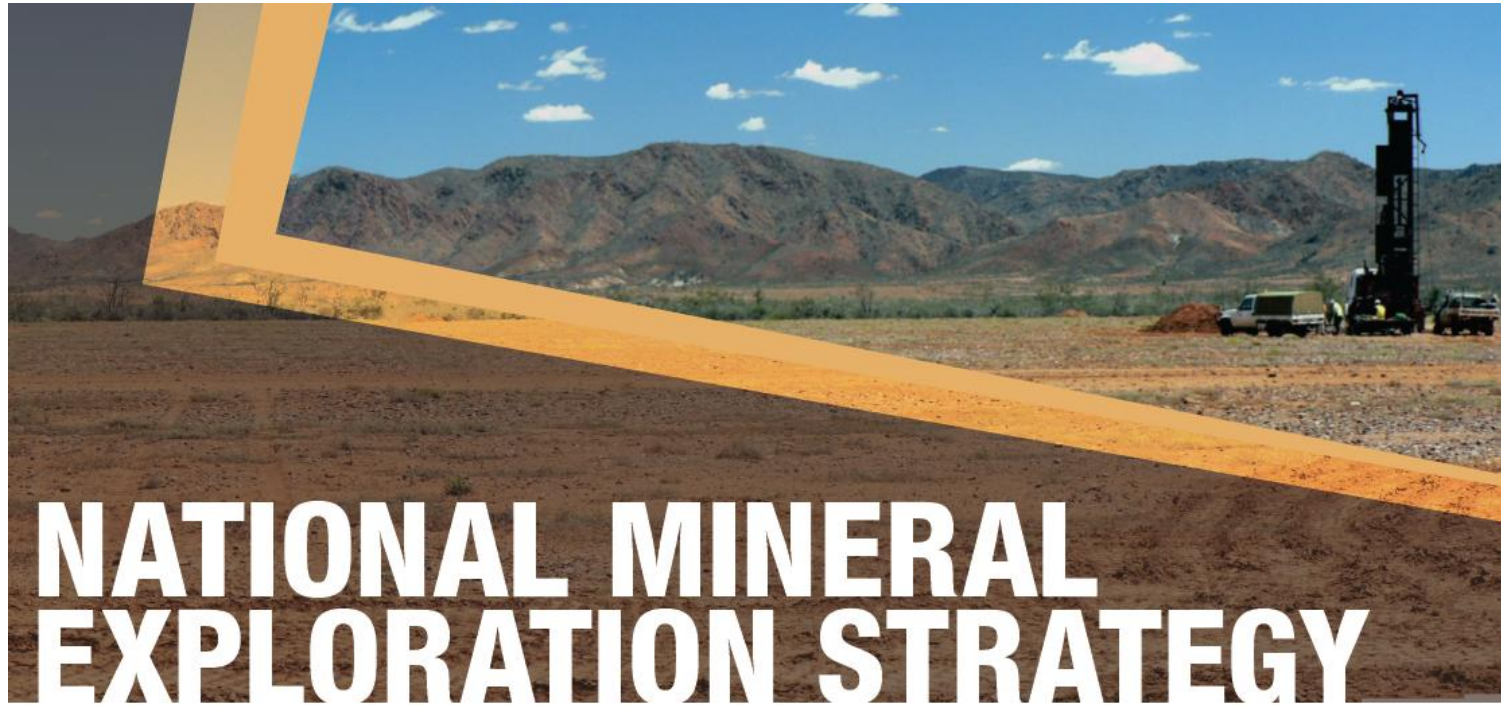
Sources: MinEx Consulting © November 2013
 Geoscience Australia

Challenges and opportunities

- Continent is ~80% covered
- How to see through the cover?
- GA's precompetitive programme aimed at delivering geoscience solutions to reduce exploration risk



Standing Council Energy & Resources (SCER) National Mineral Exploration Strategy (2012)



NATIONAL MINERAL EXPLORATION STRATEGY

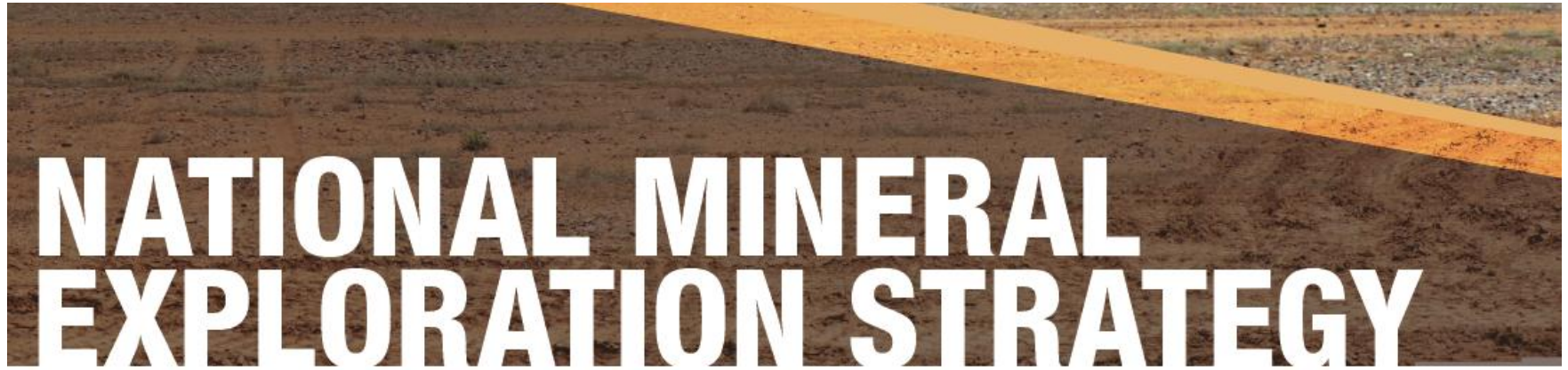
VISION:

Unlocking Australia's hidden resource potential.

MISSION:

To address greenfield exploration challenges, stimulate new discoveries, ensure continuity of the pipeline of mineral resource investments, and the longevity of Australia's mineral resources industry.

Three elements to National Mineral Exploration Strategy



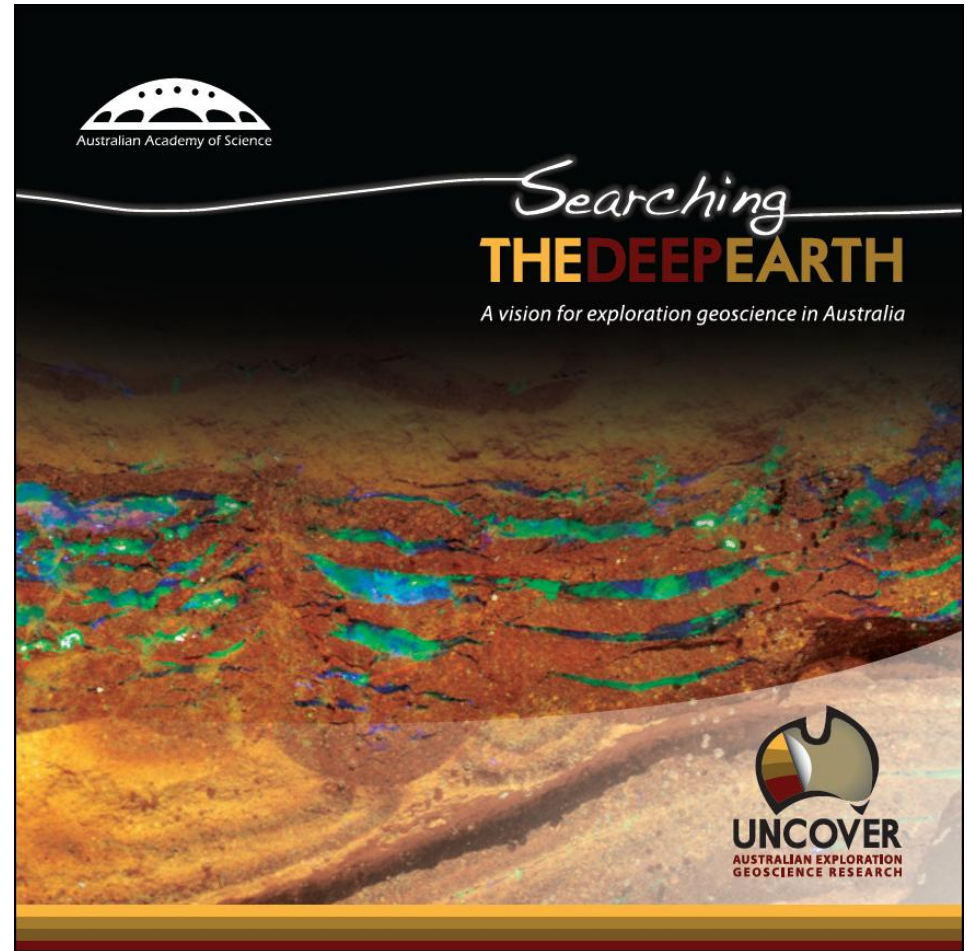
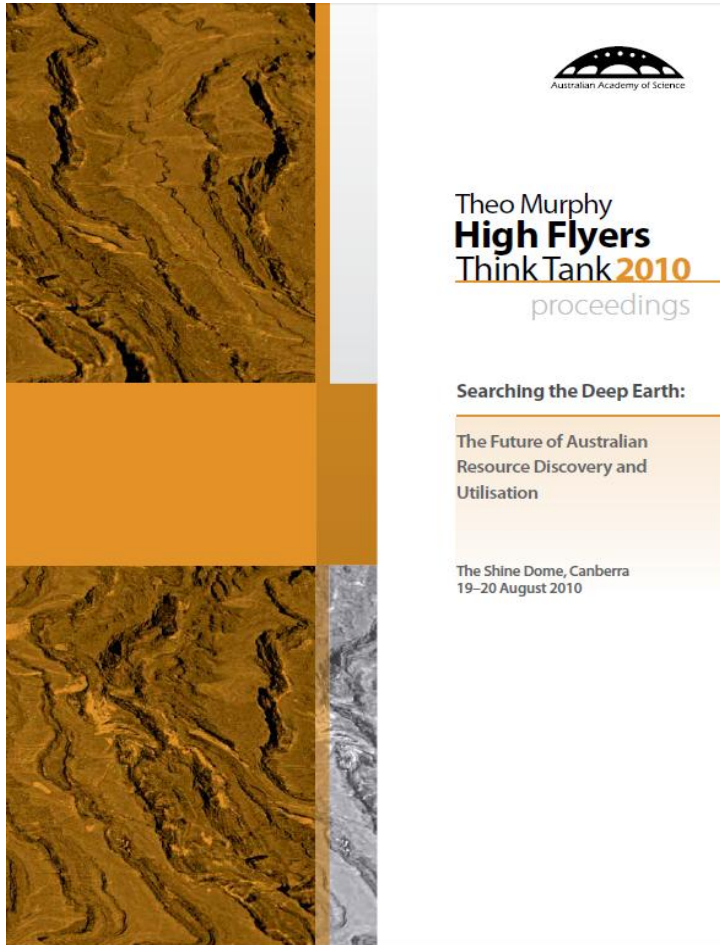
THE THREE ELEMENTS OF THE NATIONAL MINERAL EXPLORATION STRATEGY ARE:

PRE-COMPETITIVE
GEOSCIENCE INFORMATION

MINERAL EXPLORATION
INVESTMENT ATTRACTION PLAN

NATIONAL GEOSCIENCE
RESEARCH INITIATIVE

UNCOVER: the essential collaboration



<http://science.org.au/events/thinktank/thinktank2010/index.html>

<http://science.org.au/policy/uncover.html>

Timing – counter cyclical

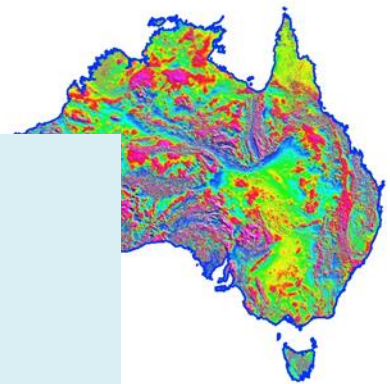
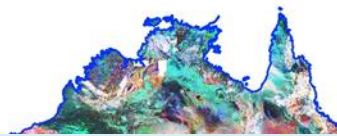
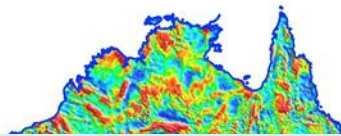
- Investment by Government (NGA)
- Exploration Development Incentive
- Red/green-tape removal
- Tax repeal
- UNCOVER
 - Ideas, tools, techniques
- Prepare Australia for the upswing in demand
- Develop leaders in undercover discovery



Illustration by Jac Depczyk



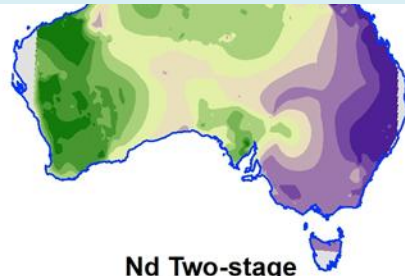
1:1M Surface Geology



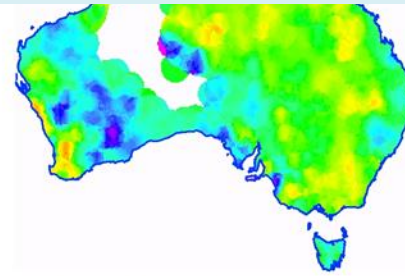
Magnetics



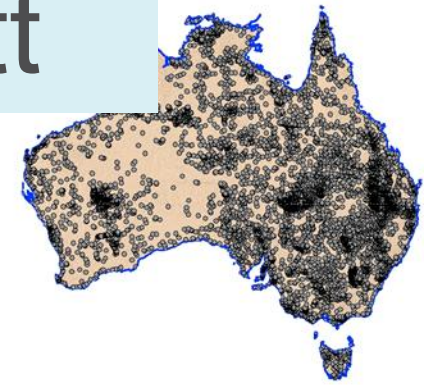
Onshore Seismic Lines



Nd Two-stage
Depleted Mantle Model



National Geochemical Survey



Water bores

GA's program: Dr Andy Barnicoat Dr Richard Blewett

Data from Geoscience Australia and State/NT geological surveys

14-8099-5



Summary

Australia has:

- major greenfield potential in extensions of known mineral provinces undercover and new provinces
- opportunities for many commodities

UNCOVER harnesses much of the nations capability to make Australia globally competitive again:

- GA and State/NT Surveys deliver pre-competitive data at continental and regional scales to reduce risk in exploring frontier regions and under cover
 - Value-added products for exploration include:
 - new methods of data processing (e.g. inversions on NCI)
 - integration of multidisciplinary data with new mineral systems concepts
 - Cover thickness methodology

Information available on-line at:

www.ga.gov.au/minerals

www.geoscience.gov.au/

Thank you



Australian Government
Geoscience Australia

Unlocking Australia's hidden mineral resource potential