

**National Committee
for Earth Sciences
Australian Academy of Science**

**Review of:
National strategic plan
for the geosciences 2003**

Geoscience — unearthing our future

The National Committee for Earth Sciences has conducted a review of the 2003 Strategic Plan to examine how far the strategic issues have been addressed, what remains to be done and what further developments are needed.

The material is organised around the goals specified in the 2003 Plan accompanied by their critical factors, with commentary against the recommendations under each heading.

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National strategic goals and critical factors for the geosciences

Goal 1: Education

A sustainable and wealthier Australia through more effective geosciences education

Critical factors

The critical factors associated with this goal are listed below, with links to the NRP and/or structural objectives (SO) identified by bracketed text.

1. Strong general support for science, engineering and technology disciplines (NRP 1, 3, 4 and SO 2, 3, 4).
2. A funding model for higher education that recognises the national significance, and education costs, of geoscience, emphasises quality over quantity, and facilitates effective development of core and specialist geoscience skills (NRP 1 and SO 1, 2, 5)
3. A stronger focus on world-class research and graduate centres, networked with smaller departments (SO 1, 2, 3, 4, 5).
4. Geoscience-scholarships that encourage students to fill skill-gaps in the nation's ability to address the NRPs (NRP 1, 3 and SO 2).
5. Awareness by Australia's decision-makers of: the value of geoscientific knowledge when making decisions that involve Australia's natural resources; and how the geoscience community can contribute to the effectiveness of their decision-making processes (NRP 1 and SO 4, 5).
6. Motivation of school students to pursue geoscience careers (NRP 1, 3, 4 and SO 1, 2, 4).

Recommendations:

The NCES recommends the following.

1. That government moves to a funding model for higher education that recognises the national significance, and education costs, of geoscience so as to ensure the long-term viability of geoscience education and training, including:

- *relocation of the geosciences from Cluster 8 to Cluster 10;*
- *extension of funding under the Higher Education Innovation Program for a further five years; and*
- *strong support for science, engineering and technology disciplines in general.*

Government initiatives have provided additional support for Science through, e.g., the National Cooperative Research Infrastructure Strategy (NCRIS) and the 2009 Super Science Initiative

There have also been adjustments to the Higher Education funding bands, but this has not advantaged the geosciences

2. That government and universities collaborate to modify the university funding model and its implementation, ensuring:

- *provision for stable, base-level funding to maintain viability of a diverse group of university geoscience departments, despite cyclicity in undergraduate enrolments — specifically, implementing the 'variable rate learning entitlement' funding model proposed in the Higher Education Review, to give direct recognition to the costs and significance of geoscience, as an area of national priority, and of small but vital disciplines such as geophysics;*
- *investment in critical core-skills, including those highly specialist skills where the need is critical but is satisfied by a small number of highly competent graduates;*

Goal 2: Research

A vibrant, world-leading, geoscience research community

Critical factors

1. An inspirational research program that contributes strongly to future geoscientific knowledge and skills and attracts high-quality researchers and adequate funds (NRP 1, 3, 4 and SO 1, 2, 3, 4, 5).
2. An improved funding model for major research facilities and infrastructure to ensure effective use of the significant capital investment and to facilitate access (SO 2, 3, 5).
3. Development of an effective oceanographic research capability (NRP 1, 3 and SO 1, 2, 3, 4, 5).
4. Investment in a major geotranssect to gain fundamental information about the Australian plate, from its basic structure and evolution through to its mineral and petroleum systems and surficial processes (NRP 1, 4 and SO 1, 3).
5. Relaxation of restrictions on recognition of government appropriation funds in granting schemes (SO 4, 5).

Recommendations:

The NCES recommends the following.

1. *That the ARC continues to support excellence, diversity and innovation in funding basic research including new opportunities detailed in this section.*

ARC Grant funding for the solid Earth Sciences has seen a decline, but more broadly funding levels have been approximately maintained.

2. *That the ARC supports the basic, strategic and applied research outlined in sections 5 and 6.*

ARC LIEF is the major contributor to the IODP subscription and there has been continuing investment in geochemical infrastructure.

3. *That government provide strong and continuing support for major research infrastructure, particularly ensuring more effective use of the significant capital investment in national research facilities, by:*

- *providing predictable opportunities for capital acquisition;*
- *funding operational support, maintenance, and top quality technical support; and*
- *funding travel and accommodation so that qualified researchers are able to access the facilities.*

The NCRIS AuScope funding secured for the Earth Sciences provided valuable capital investment together with operational and maintenance funds.

This Project Plan undoubtedly provides opportunities for Australian Geoscience in terms of building a Data Commons infrastructure for Geology and Geophysics. It is not yet clear how the Geoscience community should become engaged. In addition there is a reluctance on part of some Universities to permit their employees to contribute their data to Data Commons archives open to the public. This highlights some policy issues (University policies are out of sync with federal funding provided for Data Commons infrastructures).

4. *That government provide substantial new funding to develop Australia's marine geoscience capacity, ensuring:*

- *development of a vital marine geoscience community;*
- *development of, and access to, a modern, effective national marine geoscience infrastructure, including a national shallow-coring facility; and*
- *collaboration with the Integrated Ocean Drilling Program.*

The announcement in the 2009 budget of funding for a new blue-water research ship is most welcome.

A successful ARC LIEF bid from a consortium for Universities and CSIRO has secured funding for a 25% IODP Membership from 2008 and now modest funds for research support for cruise participants.

5. *That the nation invest in a major geotranssect study to gain fundamental information about the Australian plate, from its basic structure and evolution through to its mineral and petroleum systems and surficial processes by:*

- *universities and government research agencies developing and implementing a collaborative plan for the most effective geotranssect considering the unique opportunities in Australia; and*
- *the ARC supporting this activity, including through its new Research Networks Program.*

A National Geotranssects Working Group has prepared a concept of corridors across the country where investment is likely to have high return – this has helped planning but not funding.

Through AuScope investment has been made in reflection profiling (North Queensland, SA/NT, Western Victoria, NW WA –planned) mostly in concert with GA and State agencies that contributes to the transect concept. Areal coverage with passive seismic arrays has also been deployed to try to enhance 3-D structural resolution near reflection lines (SA, QLD).

There is no coordinated mechanism for transect work, and future reflection work is likely to be oriented towards potential economic rather than scientific targets.

6. *That government free up restrictions on recognition of appropriation funds from government research agencies in granting schemes such as the ARC linkage grants.*

The provisions regarding “dual funding” are imposed more severely than before. Geoscience Australia is regarded by ARC as a government Research Agency, despite the views of GA itself, because the word research enters in a departmental description.

7. *That the recommendations of the House of Representatives Standing Committee on Science and Innovation, with respect to increasing business investment in R&D, are implemented.*

The initiatives outlined above, complemented by A\$19.5M EIF funding for the Sydney Institute of Marine Science, A\$ 45M EIF funding for the Institute for Marine and Antarctic Studies at the University of Tasmania, Hobart, continuing funding for AIMS, and smaller initiatives at various universities in Australia have certainly contributed new funding to develop Australia's marine geoscience capacity.

An ongoing concern is maintaining momentum in Australia's marine geoscience capacity. Membership to the IODP is secure until 2012. The reliance of IODP membership on the ARC LIEF scheme may not be successful as a long-term strategy, since it depends heavily on matching support from individual university partners. Geosciences schools and departments in most Australian universities do not have a strong marine component. If resources are not available for Australian universities to expand marine studies programs through hiring of new staff and increasing undergraduate placements, these Universities may not have the capability of making full use of IODP membership and may opt out of any future LIEF initiative. Long-term IODP membership, therefore, depends on increasing marine science research and teaching capabilities within universities, or an independent funding model in the future.

2. *That government fund a coordinated national program involving government agencies, universities and other organisations that will provide information on the geological controls of groundwater distribution, resources and quality. Such a program should:*
 - *encompass remote regions, where the major potential use of groundwater could be for mining and mineral processing, and tourism, as well as for agriculture*
 - *determine the national stock of ground waters; and*
 - *determine the quality of the groundwater.*

Department of Primary Industries, Primary Industries and Resources South Australia and the Minerals Council of Australia. It brought together 155 research scientists, drawn from both in-kind contributions and cash-funded positions in participating organisations. From 2001 to 2008, the Centre received in-kind salaries and resources of some \$94 M, in addition to its original budget of A\$38M of income from CRC grants, participant contributions and industry.

- *map and understand the surface and near surface geology and hydrology (regolith, soils, bedrock, water, vegetation) with high-resolution geophysical and spectral remote sensing techniques using airborne and space platforms, and targeted ground truthing;*

Significant additional funding to dryland salinity and water quality studies in the 2003-2009 period arose from the National Action Plan for Salinity and Water Quality (NAPSWQ), which included several Earth Sciences initiatives.

- *determine the range in, and rate of, change of climatic conditions, sea level and landscapes in geologically recent (deep) time and their effect on the size, diversity, location and migration of ecosystems (Australia's biodiversity);*

Climate-change research in the 2003-2009 period has been driven by Australia's participation in the IPCC. Other major initiatives on climate change arose through the Education Investment Funding Round 1 and current proposals in the sustainability round.

In addition, the ARC Discovery program was instrumental in funding a number of projects whose main topic was climate-change. These projects amount to ca A\$ 33M in research investment on the topic.

CSIRO Land and Water also carried out significant research on climate and the consequences of climate change in Australia.

The establishment of the Department of Climate Change creates opportunities for intensifying the pace of climate-oriented research in Australia. So far, however, the Department has mainly concentrated on policy issues and has not developed its own research portfolio.

- *determine the feasibility, methods and cost of safe long-term storage of greenhouse gases created by power generation and by hydrogen manufacture for fuel cell technology;*

Greenhouse gas capture and storage is a major focus of research for government, maes on cli e

- *determine a sustainable rate of use of groundwater. Specific initiatives are: to determine the rates of water withdrawal and resupply, the age of the groundwater, the climatic conditions prevailing when it was supplied, its residence time in the aquifer, and the effects (e.g. subsidence) of its withdrawal.*

4. *That government agencies support a program to:*

- *assess the quality, quantity and accessibility of sand, mineral and stone for the building industry near cities and sites of coastal development;*

This recommendation has not been implemented and the assessment of the quality, quantity and accessibility of sand, mineral and stone for the building industry near cities and sites of coastal development is still carried out in an ad hoc way, with no concerted effort uniting industry, research organizations, academia, and government agencies.

- *determine the residence time and resupply rate of Australian soils;*

Limited studies on the residence time and resupply rate of Australian soils have occurred as minor components of ARC Discovery projects, CRC LEME focussed research, and collaboration with international researchers working in Australia.

- *determine the extent and effects of dryland salinity in cities;*

Limited studies on the effects of dryland salinity in cities have been carried out by the CRC LEME, and state geological surveys and natural resources departments.

- *identify building material and other resources and plan their extraction before they become inaccessible as a consequence of land-development;*

This recommendation has not been implemented in any systematic way.

- *compare past changes in climate and ecosystems with the present effects of human*

Goal 4: Wealth

A wealthier Australia through discovery of new clean

- Major advances include release of two major new national datasets with wide application - the seamless digital geology of Australia (compiled by GA in partnership with the States/NT) and the first national radiometric map and grid prepared by GA .
- The Predictive Mineral Discovery CRC and the CRCLEME (both concluded June 2008) made substantial contributions to knowledge on the distribution and regional and local controls on mineral deposits and developed new methods and tools for mineral exploration.
- The Minerals Down Under Flagship (CSIRO) is focussed on developing new technology for advanced mineral processing and discovery under cover.
- Continuing ARC CoE funding for CODES at the University of Tasmania
- The new CRC for Deep Exploration Technologies has been stabilised to support enhanced mineral discovery especially under cover,

2. That government agencies support a program to characterise the geological provinces of Australia. Specific initiatives associated with this strategy are to:

- *develop a regional scale understanding of the formation of mineral provinces;*
- *define areas to explore for mineral deposit types that are known elsewhere in Australia; and*
- *define terranes in which to explore for ore types currently unknown in Australia.*

The Predictive Mineral Discovery CRC made