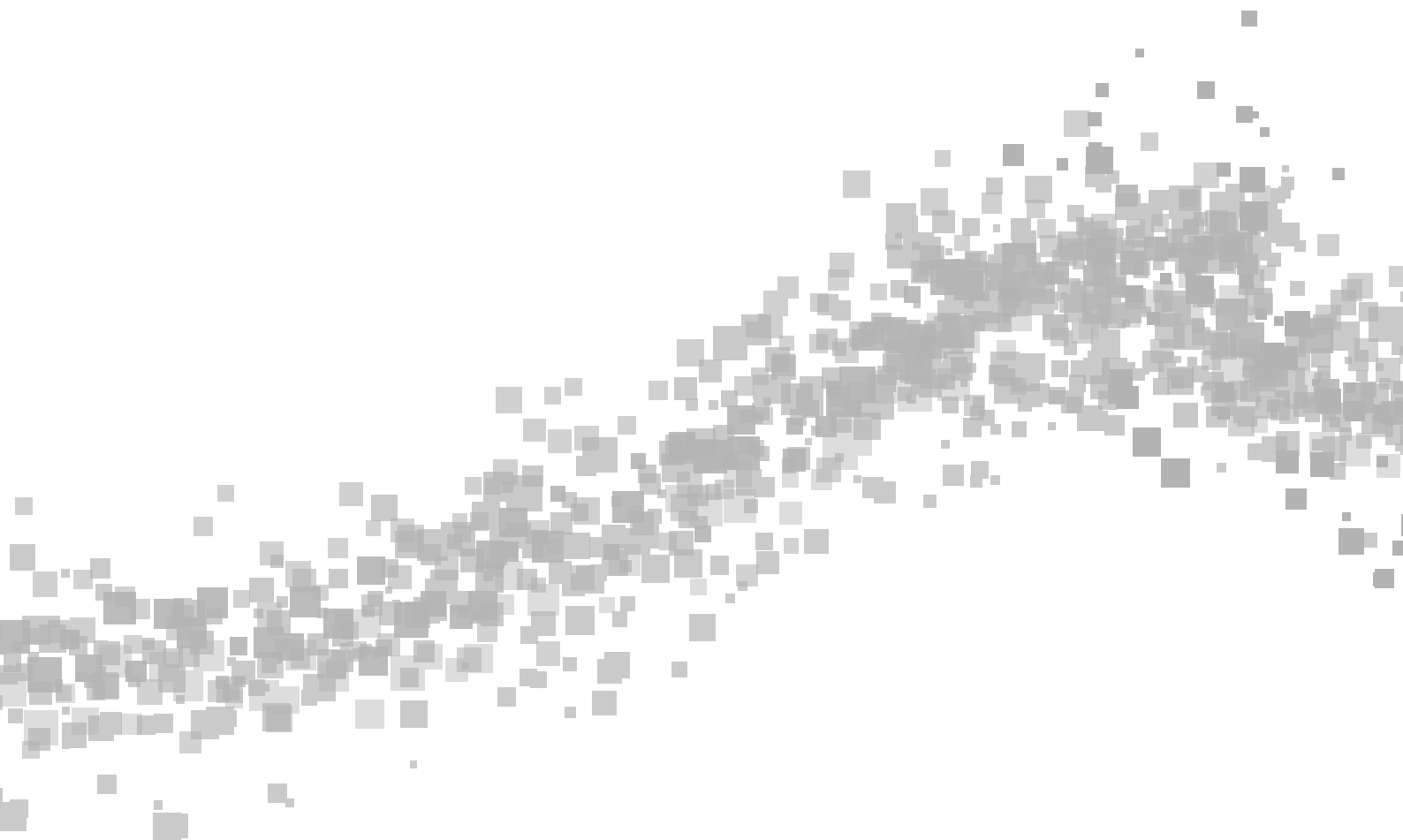




EVALUATION OF THE INTERNATIONAL
SCIENCE LINKAGES PROGRAM

FEBRUARY 2011





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Front cover: photos provided by the Australian National University and the Australian Nuclear Science and Technology Organisation

ISBN 978-0-642-72634-6

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GLOSSARY

| | |
|--------------|--|
| AAH | Australian Academy of the Humanities |
| AAS | Australian Academy of Science |
| ACIAR | Australian Council for International Agricultural Research |
| AIMS | Australian Institute of Marine Science |
| AISRF | Australia-India Strategic Research Fund |
| ALP | Australian Labor Party |
| ANR | French Research Agency |
| ANSTO | Australian Nuclear Science and Technology Organisation |
| APEC | Asia-Pacific Economic Cooperation |
| APP | Asia Pacific Partnership on Clean Development and Climate |
| ARC | Australian Research Council |
| ASSA | Academy of the Social Sciences in Australia |
| ATSE | Academy of Technological Sciences and Engineering |
| BGI | Beijing Genomics Institute |
| CAETS | Council of Academies of Engineering and Technological Sciences |
| CERN | European Organization for Nuclear Research |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| DAAD | German Academic Exchange Service |
| DFAT | Department of Foreign Affairs and Trade |
| DIISR | Department of Innovation, Industry, Science and Research |
| EC | European Commission |
| EMBL | European Molecular Biology Laboratory |
| EU | European Union |
| FAST | French-Australian Science and Technology Program |
| FEAST | Forum for European-Australian Science and Technology Cooperation |
| FP7 | European Union 7 th Framework Programme |
| GA | Geoscience Australia |
| Go8 | Group of Eight universities |
| GSF | Global Science Forum |
| HASS | Humanities, Arts and Social Sciences |
| HoR | House of Representatives |



| | |
|------------------|---|
| IAP | Innovation Access Programme |
| IAP-IST | IAP – International Science and Technology |
| ISL | International Science Linkages |
| JSC | Australia-French Joint Steering Committee |
| JST | Japan Science and Technology Agency |
| KEK | High Energy Accelerator Research Organization |
| KPI | Key performance indicator |
| LIEF | Linkage, Infrastructure, Equipment and Facilities scheme |
| MEXT | Japanese Ministry of Education, Culture, Sports, Science and Technology |
| MOST | Chinese Ministry of Science and Technology |
| MoU | Memorandum of Understanding |
| NCRIS | National Collaborative Research Infrastructure Strategy |
| NHMRC | National Health and Medical Research Council |
| NICTA | National ICT Australia |
| NSF | National Science Foundation |
| OECD | Organisation for Economic Co-operation and Development |
| PhD | Doctor of Philosophy |
| PMSEIC | Prime Minister’s Science, Engineering and Innovation Council |
| S&T | Science and Technology |
| SKA | Square Kilometre Array |
| US | United States of America |
| USyd | The University of Sydney |
| VIC DIIRD | Victorian Department of Innovation, Industry and Regional Development |

EXECUTIVE SUMMARY

The International Science Linkages (ISL) program has for ten years been the Australian Government's leading mechanism for increasing Australia's participation in international research, for strengthening strategic partnerships between the Australian and overseas research communities, and for facilitating access by Australian researchers to global technology and science facilities.

The ISL program advances these priorities by funding international staff exchanges, fellowships and workshops to promote *ideas exchange* and *relationship building*; providing competitive grants for *collaborative research projects* with overseas partners; and funding travel so that Australian researchers can *access major research infrastructure* not available in Australia. ISL funding has averaged around \$10 million per year since its inception.

The program is focussed on supporting Australia's strategic priorities and encouraging stronger and more numerous international collaborations. The program works to reduce the barriers that inhibit the development of robust, enduring relationships with researchers in countries of strategic importance to Australia. It includes an important focus on pre-project activities such as conferences, workshops and detailed scoping work that form part of the spectrum of an effective research dynamic. In doing this, the program supports the government's productivity agenda by increasing innovation, in particular through the capabilities of our universities and public research agencies.

In 2009–10, the Australian Government invested more than \$8 billion in science and innovation to enable discoveries that create wealth and improve the lives of Australians. Research investment in total, including by business and higher education institutions, was \$24 billion. Studies have shown that the impact of research is markedly higher for papers that involve international collaboration and co-authoring and that research experience in another country can contribute to higher citation rates of individual researchers¹. Active Australian engagement with the world scientific community provides access to overseas expertise and infrastructure and in so doing increases the effectiveness of Australia's investment in science and innovation². The importance of this engagement to the effectiveness of our research is borne out by Australia covering some 3 per cent of the global research effort and the fact that, in spite of our size, we have established a scientific profile through a program such as ISL which enables us to compete and collaborate on the world stage.

Reflecting the above, the ISL program is an important element of the Government's innovation policy agenda, *Powering Ideas*, and importantly relates critically to the National Innovation Priority that seeks to increase collaboration between Australian and overseas researchers.

The program is also aligned with the Government's international objectives, as international science engagement forms part of Australia's relationship building with key bilateral and multilateral partners including China, India, the United States and Europe. The ISL program helps to promote a positive and contemporary image of Australia abroad. Reporting from Australia's diplomatic missions in Beijing, Seoul and Berlin, commissioned as part of the evaluation, has strongly endorsed the value of the program in this regard.

1 OECD (2008), *The Global Competition for Talent: Mobility of the Highly Skilled*

2 For example, physical access to people-based networks and expertise in other countries complements the role of ICT infrastructure by providing access to vital tacit knowledge or 'know-how' which is typically not amenable to transfer via remote communications. Access to such knowledge can be particularly vital for the development of an understanding of state-of-the-art technological processes and developments developed elsewhere.





There are a range of mechanisms by which a program such as the ISL can provide value add. Some key research partners, such as China and the European Union require government-to-government collaboration agreements. Governments release funds for the pre-project activities that are essential to facilitating the on-going research collaborations. This ensures the effectiveness of government supported mechanisms in ensuring project funding is available from both Australia and the partner country. Through its role in establishing strategic directions for ISL investment, the government is well placed to ensure the activities supported through an ISL grant complement our wider research and foreign policy efforts and appropriately reflect national needs and priorities. In particular, it can take a co-ordinated view across the innovation system as a whole, in a global context, to spot gaps and address opportunities, as well as ensure that the program as a whole is aligned and coordinated with other government objectives.

For these reasons, there will be an enduring need for government programs that facilitate Australia's international science engagement and enhance the return on Australia's investment in science and innovation.

As part of the evaluation, the Allen Consulting Group reviewed the nature and operation of the ISL program. Allen Consulting concluded there was strong domestic and international stakeholder support for Australia's international research engagement, and a sound public policy case for the program. They noted there was a strong case to extend ISL funding into the future and enhance the scale of the program. In supporting these conclusions, Allen Consulting's survey showed that:

- the collaborations facilitated by the program lead to significant outputs (such as joint research publications) and outcomes (in terms of deeper and longer term research partnerships, improved expertise, knowledge, skills and quality of research);
- active involvement of governments in both partner countries ensures that collaboration occurs in areas of mutual strategic importance and opportunity; and
- the majority of survey respondents were satisfied with the administration of the program although there is scope for improvement as regards compliance and performance reporting.

Allen Consulting also concluded that the ISL program fills a gap not covered by other initiatives. Unlike the ISL, Australia's major research funding mechanisms are not primarily designed to establish new or emergent international collaborations, they are not linked to specific country/subject research priorities nor solely targeted at increasing international engagement. While funding some international activity, the ARC and NHMRC primarily focus on domestic research and on funding specific projects based on their research merit. The collaborative links and engagement funded by the ISL may seed projects that are subsequently funded by these other bodies hence the programs have an important element of complementarity.

The evaluation exercise found extensive evidence that ISL funded projects result in flow-on benefits such as additional research collaborations, and that they are successful in building international research relationships that grow in scope over time. Particular examples include:

- seed funding provided under the program has contributed to major research and development investments including the recently announced \$130 million Victoria-Suntech Advanced Solar Facility, a collaborative venture between Swinburne University of Technology and Suntech Power (China);

- the technical and scientific exchange between researchers from Australia and the United States supported under the ISL program culminated in the construction of the Low Frequency Demonstrator telescope in Western Australia both as an important scientific venture in its own right and as an initial step in the Square Kilometre Array project;
- from support for an Australia-China Symposium on Living Sustainability in 2004 and some initial seed funding, the ISL program helped found the Australia-China Centre on Water Resources Research in 2006. The Centre has attracted \$3m in funding from a range of sources in Australia and China with its key Australian facility at the University of Melbourne; and
- support by the ISL program for the Australia-China Young Scientist program led to the exchanges and partnerships that were the origin of the China-Australia Centre for Phenomics (Bird Flu) Research at the ANU recently established jointly by the Australian and Chinese Governments.

The evaluation noted private sector involvement in the program overall was limited. There may be scope to improve awareness of opportunities under the program directly and also through the entrée it provides to major research endeavours such as through the 7th European Framework program with its collaborative/private sector focus.

In the absence of an effective international research collaboration program, Australia would be less able to build enduring relationships with countries of strategic importance and less competitive with developed and developing nations who are increasing their science collaboration effort³. This could serve to limit the scope and impact of Australia's research effort, thereby reducing the return on Australia's investment in science and innovation and the broader return to the Australian economy and community. Among other things, this could threaten Government endeavours such as the bid to host the SKA radio telescope initiative. The outcome of these endeavours will be influenced by the perception of Australia's science globally including our overt government to government investment and capabilities to perform at world class levels.

As a result, there is a very strong need for the continuation of an international science engagement program. Given the substantial outcomes and impact of the projects and activities undertaken, and the high level of excess demand for the ISL program, funding for the program should be doubled to around \$20 million per annum. This is also supported by the increased emphasis on international engagement, the emergence of China as a significant research partner and an overall increase in research funding since the program's inception in 2001.

Science engagement effort should be targeted at those countries of strategic research and international importance to Australia. China's primary importance to Australia's trade and economic growth, its rapidly expanding research capability and the effectiveness of the existing Australia-China Special Fund indicate that collaboration with China should form a major element of Australia's future science engagement activity.

3 OECD (2008), *The Global Competition for Talent: Mobility of the Highly Skilled*. International co-authorship has been on a strong upward trend in recent years, as countries around the world recognise the benefits of international collaboration and the global research workforce becomes increasingly internationally mobile. In the field of astronomy, for example, over 50 per cent of academic articles were co-authored in 2001.





The ISL program has had a number of components and has been evolving since its inception. The use of the program to support strategic research relationships has been increasing and this emphasis should continue. It will however need to be supplemented by specific research funds to exploit the on the ground opportunities from collaboration that those strategic relationships provide. The outsourced components of the program supplement those activities by utilising the expertise of the academies to identify opportunities for early stage research engagement. While inevitably flexible between the components and over time, the three level strategy covering the spectrum of top down government driven strategic activity to bottom up expertise of the science community is a basis for the program to move forward.

This evaluation brings together evidence that shows how effective the ISL program has been in supporting the government's policy agenda, how effectively the program has been administered, and how it might be improved, given the experience of the past decade.

KEY FINDINGS OF THE EVALUATION

Strategic Policy Alignment

- 4.1 The ISL program has been well aligned with Australia's innovation and foreign policy objectives: helping to ensure that publicly funded research is of high quality and supports economic growth, and projecting a sophisticated image of contemporary Australia that can be leveraged for Australia's broader international objectives.

Appropriateness

- 5.1 To maximise the economic, social and environmental impact of Australian research, Australia must engage with the international science community and access knowledge, research expertise and infrastructure that is not available in this country.
- 5.2 A government program of science engagement is necessary to improve the return on Australia's science and innovation investment through the development of strong international relationships and the identification of emerging opportunities for collaboration.
- 5.3 It is appropriate that the Government's international research collaboration program be delivered by the Department of Innovation, Industry, Science and Research (DIISR) in consultation with other relevant government agencies and the research community.

Effectiveness

- 6.1 Projects supported by the competitive components of the ISL program have been highly effective in achieving the objectives of increasing the participation of Australian researchers in leading edge international research and strengthening collaborative relationships.
- 6.2 Partner/subject specific bilateral and multilateral granting processes are particularly effective in supporting research collaboration as they ensure funding is available from partner countries.
- 6.3 The ISL program has encouraged and supported the involvement of early career researchers in international research collaboration.

- 6.4 Science engagement funding needs to support collaboration on the development and/or conduct of joint international research projects which contribute to Australia's competitiveness and productivity.
- 6.5 Strategic engagement with priority partner countries is essential to underpin the development of effective international research relationships.
- 6.6 Two-way communication and awareness raising activities are a necessary part of Australia's strategic international research collaboration framework.
- 6.7 The sub-contracted components of the ISL program have been able to draw on the expertise and networks of the administering organisations to achieve effective delivery of the Academies' Program and to provide access for researchers to overseas research facilities.

Efficiency

- 7.1 The overall level of administrative expenditure on the ISL program provides value for money given the nature and scale of the program.
- 7.2 Consistent with best practice program management, application, assessment, contracting and reporting arrangements for funded activities need to reflect the scale, risk and other features associated with the respective grant type.

Integration

- 8.1 A more structured engagement with key Australian stakeholders would strengthen the setting of strategic priorities and ensure that research collaboration activities are being delivered in a complementary and coordinated manner.
- 8.2 The ISL program continues to be positioned in a way that supports international research collaboration without duplicating other Australian research collaboration activities.
- 8.3 The ISL program's activities are well integrated with the objectives and programs in partner countries.
- 8.4 Bilateral and multilateral research collaboration should emphasise agreed research areas that are of strategic importance to Australia and the partner country.

Performance Assessment

- 9.1 The ISL performance assessment arrangements have generally been effective in meeting conformance and performance monitoring needs, but there is scope to improve the relevance and collection of performance information.





RECOMMENDATIONS

1. The ISL program should be renewed and funding should be increased to the order of \$20 million per annum.
2. A larger and longer term Australia-China research fund should be given high priority in the new funding.
3. Funding should be provided for a five-year period with an evaluation at the end of three years.
4. The policy framework for the program should encompass:
 - the building of strategic research relationships via strategic investment and using the expertise of DIISR, Science Counsellors, the Learned Academies and the broader research community;
 - the strengthening of those relationships using bilateral and multilateral research funds that support the development and/or conduct of research, including follow-up funding as necessary; and
 - assistance for Australian researchers to access major overseas research facilities.
5. The program should continue to be delivered by the Department of Innovation, Industry, Science and Research.
6. Existing informal coordination mechanisms should be supplemented with an annual roundtable meeting of stakeholders, chaired by DIISR and including representatives from universities, publicly funded research agencies, research funding agencies, the Learned Academies, business representatives and other relevant Departments, to update strategic priorities and review the nature and coordination of collaboration activities.
7. The current sub-contracting arrangements with the Learned Academies and Australian Nuclear Science and Technology Organisation should continue as part of the ongoing program.
8. The network of Science Counsellors and overseas Australian missions generally, should provide support for science engagement in key partner countries, including through regular feedback on foreign government perceptions of the program and strategic intelligence on emerging developments that may pose opportunities for international research collaboration.
9. Performance assessment arrangements should be reviewed to ensure the performance indicators are appropriate and the reporting arrangements are efficient. The requirements for funding recipients to report on outcomes one year after project completion, should be continued and DIISR should investigate the cost effectiveness of a three yearly report on outcomes for a stratified sample of grant recipients.
10. In managing the program, DIISR should:
 - continue to ensure that the program actively plays to Australia's strengths by targeting research areas that are identified as a priority;
 - continue to ensure differentiation of this program from the international aspects of other programs, in particular Australian Research Council grants;
 - continue to ensure appropriate emphasis on support for early career researchers in international collaboration;





- ensure appropriate interaction with the Department of Foreign Affairs and Trade and Austrade as well as with the promotion of Brand Australia;
- take steps to increase awareness and engagement of the ISL program with business;
- provide greater codification of processes for determining strategic priorities;
- coordinate bilateral and multilateral research funding mechanisms in a way that minimises the overall administrative complexity and cost to researchers, subcontractors and governments in Australia and the partner country;
- adopt grant management arrangements which appropriately reflect the scale and risk of grant activity, including the streamlining of assessment, contracting and performance reporting requirements for smaller grants; and
- scrutinise administrative costs for all program components on an ongoing basis to ensure that management of the program remains efficient and effective.

1 INTRODUCTION

The Department of Innovation, Industry, Science and Research (DIISR) is responsible for managing intergovernmental relationships across all fields of science and research. In particular, DIISR is responsible for:

- the International Science Linkages (ISL) program;
- the Australia-India Strategic Research Fund (AISRF);
- the International Postgraduate Research Scholarship program;
- managing a number of formal government to government relationships with other countries and international organisations;
- managing high level science and research visits and meetings between Australia and other countries; and
- representing Australia's interests through a small number of dedicated science and technology staff located at key overseas posts.

This evaluation examines the appropriateness, effectiveness and efficiency of the International Science Linkages program. The program commenced in 2001 with funding over nine years from 1 July 2002 to 30 June 2011.

The evaluation reviews the ISL program in the context of Australia's current innovation and foreign policy objectives, while taking into account related international science and research activities managed by:

- DIISR (as listed above);
- Innovation Portfolio agencies including the Australian Research Council (ARC) and the publicly funded research agencies;
- other Australian Government departments and agencies that pursue international science engagement in specific thematic areas for which they have responsibility;
- universities; and
- other government, business and not for profit organisations that engage in international science engagement.

Various components of the ISL program have been the subject of earlier reviews and the program as a whole (then known as the Innovation Access Programme – International Science and Technology) was evaluated in 2003. The current evaluation takes into account the findings of these earlier reviews.

The terms of reference for this evaluation are at Appendix A and the membership of the Evaluation Team that produced this report is shown at Appendix B. The evaluation methodology is described in Section 3.





2 THE INTERNATIONAL SCIENCE LINKAGES PROGRAM

ORIGIN OF THE ISL PROGRAM

The Innovation Access Programme (IAP) was announced in 2001 as part of the Australian Government policy *Backing Australia's Ability*. The IAP consisted of three components:

- IAP-Industry, administered by the Department of Industry, Resources and Tourism;
- IT Online, administered by the National Office of the Information Economy; and
- IAP-International Science and Technology (IAP-IST), administered by the Department of Education, Science and Training.

The IAP-IST aimed to promote Australian innovation and competitiveness through encouraging access to, and utilisation of, global research facilities, knowledge and innovation. The IAP-IST program was implemented using three broad approaches: competitive grants, strategic policy initiatives and collaborative activities sub-contracted to implementing organisations.

The May 2004 *Backing Australia's Ability – Building Our Future through Science and Innovation* statement built on the IAP-IST and extended funding for a further five years. From July 2004, the program has been known as the International Science Linkages program. Total expenditure of administered funds under the program from 2002–03 to 2010–11 inclusive is expected to be \$92.5 million.

ISL OBJECTIVES

The objectives of the ISL Program⁴ are to:

- increase the uptake of leading edge science and technology (S&T) through:
 - promoting access to and participation by Australian researchers in strategically focussed, leading edge, international scientific research and technology; and
 - increasing strategic alliances between Australian and overseas researchers;
- facilitate Australia's access to the global S&T system by supporting bilateral and multilateral relations with other countries.

The Australian Government's 2009 innovation agenda, *Powering Ideas*, identified international engagement as a key priority. In that agenda, the Government adopted seven National Innovation Priorities. One of the priorities was:

Australian researchers and businesses are involved in more international collaborations on research and development⁵.

Consistent with the Government's science and innovation policy, the ISL program aims to support international relationships that increase the knowledge and expertise available to address Australia's economic, social and environmental challenges.

The program pursues this goal by developing international research relationships that include governments and all elements of the research community, and by providing cost effective access to international science expertise, facilities and funding that leverages Australia's investment in science and innovation.

⁴ Department of Innovation, Industry, Science and Research (2010), International Science Linkages Guidelines

⁵ Australian Government (2009), *Powering Ideas: An Innovation Agenda for the 21st Century*





ISL PROGRAM COMPONENTS

The program seeks to develop enduring research relationships with a range of international research partners in research topics of strategic interest to Australia. The research engagement supported by the program can be described as comprising three broad categories of activity⁶:

- *ideas exchange & relationship building* – which can be achieved via mechanisms such as international staff exchanges to discuss research topics or access improved research techniques, fellowships, conferences, and participation in multilateral science and research policy forums;
- *collaborative research projects* – which can involve collaboration on specific research projects by individual researchers, research groups and institutions, or participation in major global collaborative research projects; and
- *access to shared infrastructure* – which can include obtaining researcher access to use existing overseas facilities, or Australian participation in the development of new facilities located offshore.

Typical of the projects that enable ideas exchange/relationship building among researchers have been the Australia-Germany Workshop on Advanced Solar Photovoltaics and the Australia-Japan Marine Science Forum.

ISL support for collaboration on research projects has included funding for the China-Australia Centre for Phenomics Research which is conducting leading-edge research into Avian Influenza (Bird Flu). The Centre involves researchers from the Australian National University, the Institute of Biophysics in Beijing and other leading institutions in Australia, China and the United States.

Infrastructure access grants have enabled Australian researchers to conduct experiments at world leading facilities such as the European Synchrotron Radiation Facility in France and the Keck Astronomical Observatory in Hawaii.

The ISL program also fulfils an underlying need for effective two way flow of information between governments and their respective research communities concerning the science capabilities, research objectives and collaboration mechanisms in each country.

Figure 2.1 identifies the program components that support each type of activity: ideas exchange/relationship building, collaboration costs linked to specific research projects and access to facilities. As can be seen from the Figure, some program components have the capacity to support both research collaboration and ideas exchange/relationship building. A number of program components have ceased and new ones have been introduced during the 10 year life of the program reflecting changes in perceived priorities and needs over time. More detail on the nature of each program component is provided in Appendix C.

⁶ Based on Deloitte (2008), Impacts of International Science Engagement, prepared for the Department of Innovation, Industry, Science and Research. While these categories of activity provide a useful framework for analysis, there can be some overlap where, for example, an ideas exchange grant enables access to overseas facilities for the purpose of learning new techniques, but not for the conduct of experiments.

Figure 2.1 ISL Program components by activity type

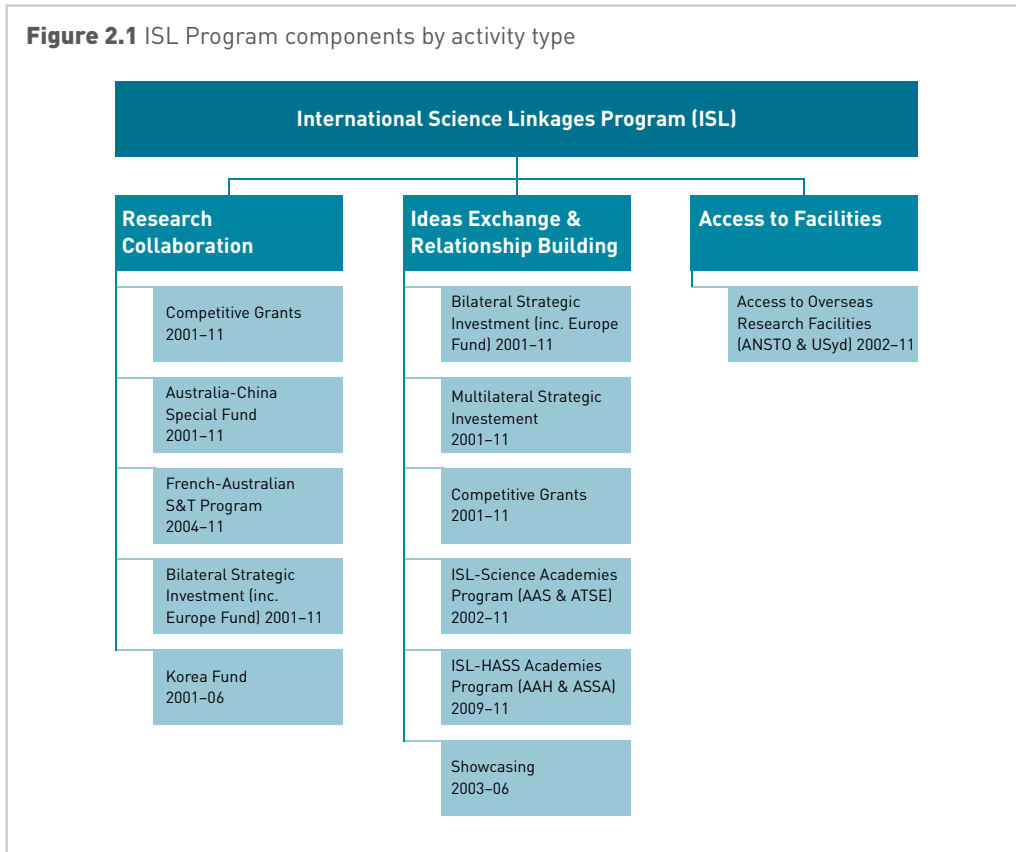
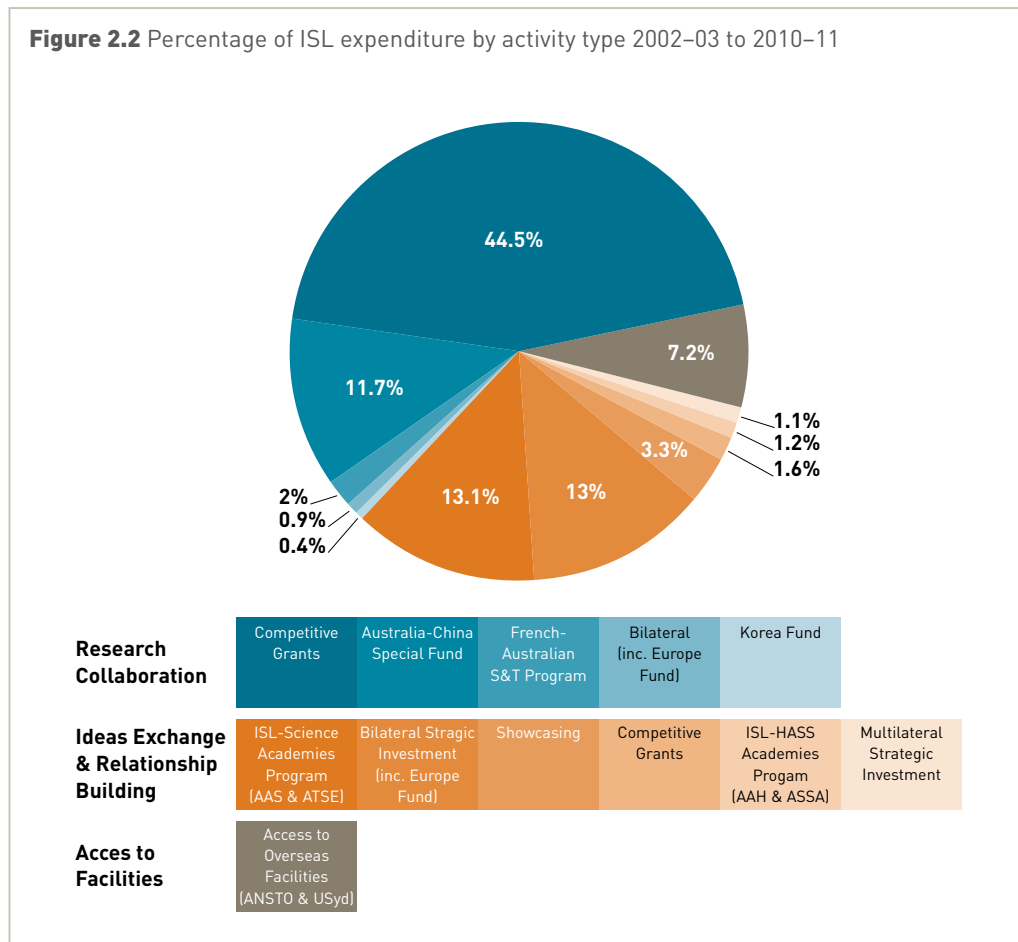




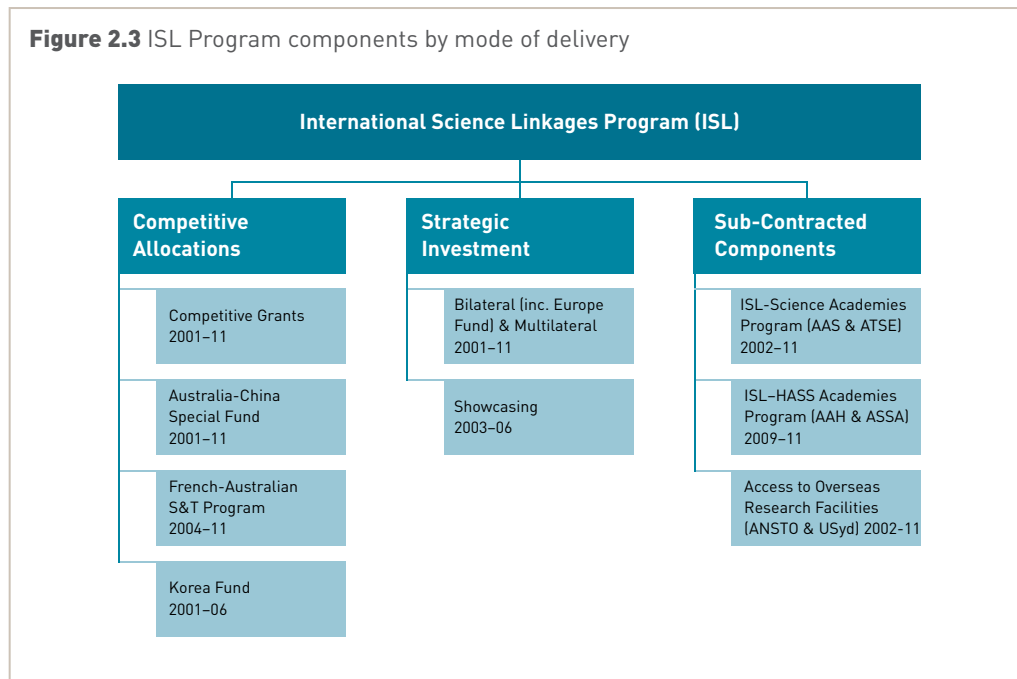
Figure 2.2 shows that, over the 9 years to 30 June 2011, 60 per cent of ISL expenditure has supported research collaboration, 33 per cent related to ideas exchange and relationship building, and 7 per cent enabled access to facilities. More detail on program expenditure is provided in Appendix D.

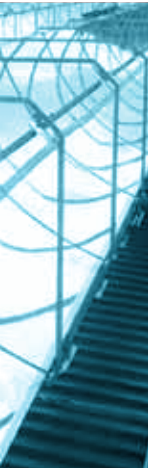


The ISL program components have been administered using three types of delivery mechanism (see Figure 2.3):

- competitive allocation that provides funding to recipients on the basis of merit;
- strategic investment that reinforces and leverages high priority links and relationships with key overseas counterparts; and
- sub-contracting where other organisations are better placed to administer an activity efficiently and effectively.

Competitive allocation of funds has involved the Department running competitive funding rounds to award grants on the basis of merit for collaborative research projects, workshops, conferences and staff exchanges.





Strategic investments have included decisions by the Department to allocate funds for workshops, staff exchanges and other activities that enhance bilateral relations with researchers in target countries, expenses that support Australia's involvement with multilateral organisations such as the OECD and, during the early years of the program, international showcasing events.

In some cases, the Department has sub-contracted the administration of program components to external organisations that are better placed to provide efficient delivery of the activity. Examples include the provision of travel grants that enable researchers to access overseas research facilities and the operation of certain workshop and exchange programs by the Learned Academies.

The ISL program has supported well over 3,000 projects and activities. This has included 452 collaborative research projects and major international scientific conferences supported through competitive funding rounds delivered by the Department.

Through the strategic investment mode of delivery, 29 showcasing events and over 200 bilateral and multilateral initiatives have been supported including workshops, symposia, exchange programs and attendance at high level meetings.

Under the ISL-Science Academies Program, the Australian Academy of Science (AAS) has supported approximately 900 staff exchanges and 170 fellowships involving 25 countries including the United States, Japan, China, France and the United Kingdom. The Australian Academy of Technological Sciences and Engineering (ATSE), also through the ISL-Science Academies Program, has delivered over 100 missions, workshops and delegations involving 40 countries including China, Japan, the United States and Germany.

The Australian Academy of the Humanities (AAH) and the Academy of the Social Sciences in Australia (ASSA), through the ISL-HASS Academies Program, have between them supported 89 international research fellowships, visiting fellowships, bilateral projects and international collaborative workshops across a variety of disciplines and countries.

Under the sub-contracted access to overseas research facilities programs, more than 1,300 researchers and postgraduate students have been provided with access to over 70 facilities in 19 countries including the United States, United Kingdom, Germany, France, Japan and Chile.

Figure 2.4 Percentage of ISL expenditure by mode of delivery 2002-03 to 2010-11

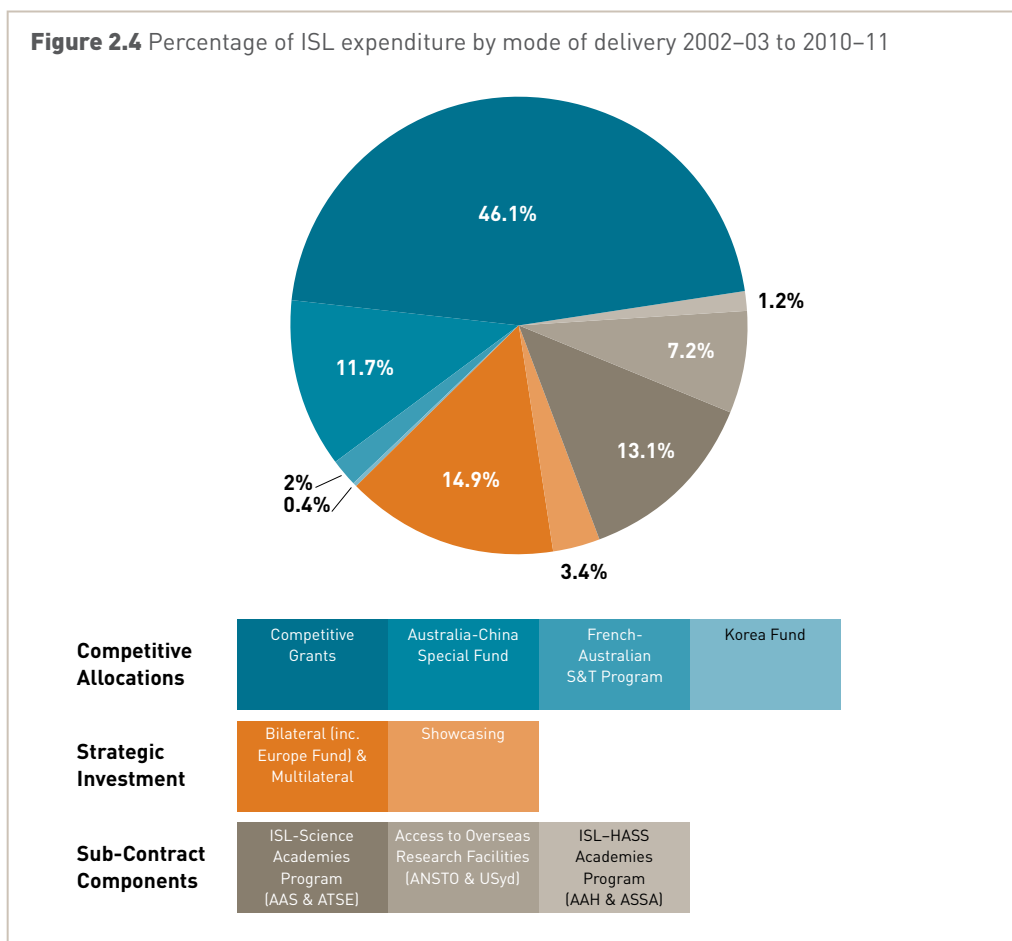


Figure 2.4 shows that 60 per cent of ISL expenditure over the 9 years to 30 June 2011 resulted from competitive allocation, 22 per cent of expenditure related to sub-contracted activities and the remaining 18 per cent involved strategic investment.



CONDUCT OF THE PROGRAM

Joint high level committees have played an important role in helping decide on strategic priorities for individual bilateral relationships and for the allocation of support under the components of the ISL Program. These joint committees bring together government officials, scientists and key stakeholders.

The committees' deliberations are informed by analysis of policies, scientific performance (most commonly based on bibliometric data) and science, technology and innovation indicators. A number of "roadmapping" exercises have been undertaken by DIISR over the life of the ISL Program in order to set strategic priorities and identify specific areas, or modalities, for cooperation.

In recent years, the competitive elements of the program have comprised three components: Competitive Grants, the Australia-China Special Fund and the French-Australian Science and Technology Program (FAST). While separate funding rounds have been held for each of these components, they have each been open to the same range of Australian applicants and have generally followed a similar assessment process.

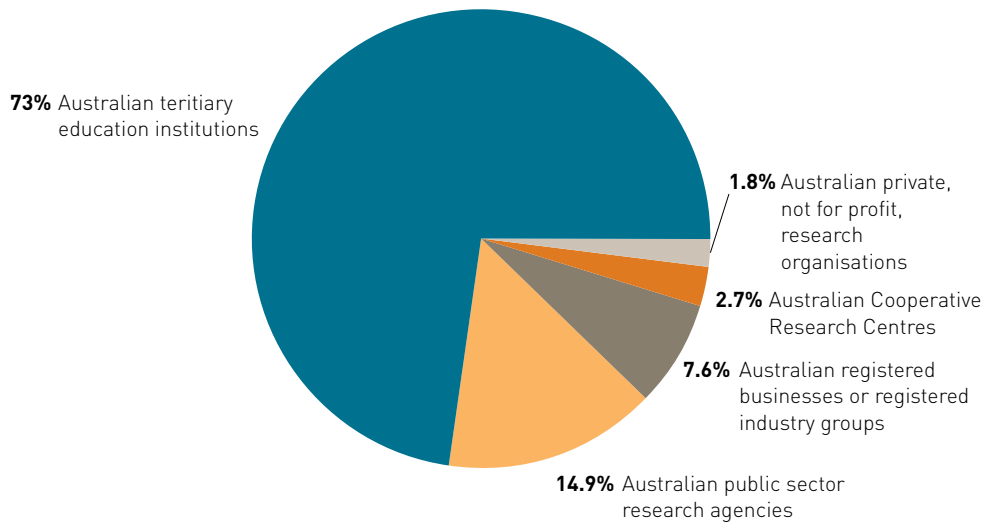
In each case, the Australian applicant has had to demonstrate that the value of cash and in-kind contributions from Australian sources will at least match the funding provided from ISL. The bilateral nature of the China Fund and FAST components has ensured that the respective foreign governments have matched the ISL contribution for these projects. For projects funded under the Competitive Grants component, contributions from the international partner have been desirable but not mandatory.

The organisations that have been eligible to apply for competitive components of the ISL program are:

- Australian tertiary education institutions;
- Australian Cooperative Research Centres;
- Australian registered businesses or registered industry groups;
- Australian public sector research agencies; and
- Australian private, not for profit, research organisations.

Figure 2.5 shows that under the competitive components of ISL, 73 per cent of grants were awarded to Australian tertiary education institutions, 15 per cent to Australian public sector research agencies and the remaining 12 per cent awarded to Australian registered industry groups, cooperative research centres and private, not for profit, research organisations.

Figure 2.5 Percentage of grants competitively awarded by organisation type



Australian applicants have applied for grants using an online registration and application process. Each application has been assessed against specified selection criteria by the ISL Assessment Panel. The Panel comprised at least two core members, appointed by the Minister responsible for Science, and a pool of approximately 20–30 subject experts.

The core members included a prominent scientist and an expert in research management and research commercialisation. The pool of subject experts comprised two to four eminent researchers in each research area.

Each application was assessed by a minimum of three panel members: two core members and a panel member, drawn from the pool of experts, whose expertise was in line with the application's field of research. The Panel's advice was then utilised in the following manner:

- Competitive Grants: the Panel's rankings were forwarded to the Minister responsible for Science for consideration and final decisions on funding;
- Australia-China Special Fund: the selection of successful applications by Australia and China was discussed jointly by the respective Government departments and informed by the Panel's rankings. Final decisions on funding were made by the Australia-China Joint Science and Technology Commission Working Group; and
- FAST: the Panel's rankings were forwarded to the Australia-French Joint Steering Committee (JSC). The JSC finalised the round rankings and provided them to the Minister responsible for Science for consideration and final decisions on funding.



The Strategic Policy component of the ISL program funds bilateral and multilateral engagement activities. The Strategic Policy component is not an open application scheme and there is no formal call for proposals. The Department has developed investment proposals and/or invited submissions from researchers or research organisations to deliver the initiatives. Submissions have undergone an internal assessment process to ensure projects met the objectives of the Strategic Policy component of the ISL program. Strategic projects were not required to demonstrate matching funding from Australian or international partners.

The Australian Nuclear Science and Technology Organisation (ANSTO) and in earlier years, the University of Sydney, have administered components of the ISL program that fund international travel costs for Australian researchers to access major research facilities that are not available in Australia.

Similarly, the Learned Academies have administered components of the ISL program that provide support for exchanges, fellowships, conferences and workshops in science and the humanities, arts and social sciences.

3 EVALUATION METHODOLOGY

The terms of reference⁷ and structure of this evaluation are based on the Expenditure Review principles published by the Department of Finance and Deregulation. Key objectives are to assess the appropriateness, effectiveness and efficiency of the ISL program.

An Evaluation Team was appointed with responsibility for the overall conduct of the evaluation. Membership of the Evaluation Team⁸ included representation from a number of organisations external to the Department to ensure that a broad range of perspectives was canvassed in developing the report. The Evaluation Team was supported in its work by an economic consultant and by staff from within the Department.

The consultant was required to gather information from stakeholders and produce a report describing its findings regarding the program. The Evaluation Team drew on the consultant's report and other material in preparing this evaluation report. The evaluation methodology involved:

- the review of relevant literature including international experience with similar activities;
- desktop research using published reports, program information held by the Department and material supplied by members of the Evaluation Team;
- collection by the consultant of new information via surveys and meetings with Australian and overseas stakeholders;
- an invitation to selected Australian Government missions abroad to report on the impact of the program in supporting broader government objectives, including collecting the views of host governments;
- preparation of a report by the consultant;
- analysis of the information to address each of the terms of reference; and
- preparation of this evaluation report.

The evaluation draws on the findings of a number of studies that have reviewed the program, or components of the program, since its commencement in 2001. In particular, the survey work undertaken as part of this evaluation was structured to enable the results to be benchmarked against the findings of the December 2003 evaluation of the program⁹.

The House of Representatives (HoR) Standing Committee on Industry, Science and Innovation tabled a report¹⁰ on international research collaboration in June 2010. The evaluation took into account the findings of the HoR report and drew on the submissions provided to the Standing Committee as part of the inquiry consultation process. The Government's response to the HoR report is due to be tabled early in 2011.

This evaluation reviews the ISL program as a whole and its performance over the ten year period from 2001–02 to the present. As a rule, however, the evaluation examines more recent program components in greater depth than earlier components, and examines larger components more closely than smaller components. Overall, the evaluation provides a thorough assessment of the effectiveness and efficiency of the ISL program and draws conclusions about the delivery of government support for international science engagement.

⁷ See Appendix A

⁸ See Appendix B

⁹ Allen Consulting (2003), Evaluation of the Innovation Access Programme – International Science and Technology, Final Report

¹⁰ House of Representatives Standing Committee on Industry, Science and Innovation (2010), Australia's International Research Collaboration





4 STRATEGIC POLICY ALIGNMENT

INNOVATION POLICY

The Innovation Access Programme – International Science and Technology (IAP-IST) was implemented as part of the 2001 *Backing Australia's Ability* innovation statement, with the ISL program introduced in the 2004 statement *Backing Australia's Ability: Building Our Future through Science and Innovation*.

Consistent with these statements, the IAP-IST was designed to strengthen Australia's research capability, support Australian participation in leading edge international scientific research and increase the economic and social impact of Australian research.

The 2009 Innovation Agenda, *Powering Ideas*, highlighted that Australia's capacity for invention and discovery is central to the nation's wellbeing as it drives productivity growth and employment, as well as transforming industries and solving social and environmental challenges.

Powering Ideas also set out a 10 year reform agenda that:

- recognised Australia must set priorities and focus its research effort in order to make the most of its available resources; and
- placed increased emphasis on the importance of collaboration, noting that it was 'increasingly the engine room of innovation'¹¹.

As a result, the Government adopted seven National Innovation Priorities. One of these priorities specifically seeks that Australian researchers and business are involved in more international collaborations on research and development. Two further priorities that are pertinent to the ISL program identify the need for high quality research and a strong base of skilled researchers.

Throughout the past 10 years, changes have been made to aspects of the program to ensure that it remains aligned with innovation policy objectives as they have evolved. For example, the program has increasingly directed resources to strategic research priorities, made provision to support researchers in the humanities and social sciences and sought to develop research skills through exchange programs targeted at early career researchers.

The importance of international research engagement was reaffirmed by Prime Minister Gillard during the 2010 election¹². The Prime Minister indicated the Government would continue to strengthen links with the best international researchers and institutions, forge closer partnerships with leading players such as China, the United States and Europe, pursue multilateral collaboration through the OECD, mega science projects and other avenues to improve access to major international research facilities.

¹¹ Australian Government (2009), *Powering Ideas: An Innovation Agenda for the 21st Century*

¹² ALP (2010), *Innovation Policy Statement*





Innovation sits behind the Government's broader economic agenda through its impact on productivity. In 2010 Treasurer Swan¹³ indicated that, as part of the broad agenda to increase Australia's productivity, the Government would be:

Supporting innovation in critical areas including innovation by business, collaboration between private and public sector researchers and investing in the research capacities of our universities and public research agencies.

AUSTRALIA'S INTERNATIONAL OBJECTIVES

International science collaboration has an important role to play in supporting the advancement of Australia's international strategic, security and economic interests. Leveraging international partnerships in the area of science can serve to enhance key relationships more broadly, strengthen multilateral and regional engagement and promote trade and investment.

Governments around the world undertake diplomatic engagement with respect to science both to support science outcomes and as part of broader relationship building. The ISL program supports such activity for Australia.

While focussing on Australia's priorities, the ISL is well received by international partners supporting both science and relationship building. The Australian Embassy in Beijing, for example, reported that Chinese officials and academics viewed the program as a model for international cooperation, noting the mutual benefits generated and the linkages forged under the bilaterally funded Australia-China Special Fund. In Berlin, the Embassy also noted strong support from German officials and the scientific community who expressed the view that a continuation of the ISL program was essential for maintaining collaborative links and research activity between Australian and German scientists and institutions.

The ISL has successfully responded to emerging relationship priorities and trends. In the second half of 2008, Australia and the European Union (EU) affirmed their commitment to a revitalised bilateral relationship through the development of an annual Partnership Framework intended to shape the future direction of bilateral cooperation. The Framework addresses a range of matters including trade, investment and sustainable development. Science engagement supports the strengthening of the relationship, underpinned by the \$4 million Australia-Europe Research Collaboration Fund that was established as a component of the ISL in September 2008. Continuing ISL investment would also be consistent with more recent commitments by Prime Minister Gillard and European Commission President Barosso to explore further Australia-EU cooperation in research and development and innovation.¹⁴

China is now Australia's most important trading partner. While trade in resources is a key part of this relationship, Australia and China also enjoy a 30 year history of research collaboration, celebrated in 2010. Building on these links provides an opportunity to invest in future science engagement opportunities. These, combined with Australia's strong trade in resources with China, offer the potential to bring a longer term perspective to the bilateral relationship that is consistent with the evolution of the Chinese economy towards higher value production.

¹³ Treasurer Swan (2010), Media release: Government's Productivity Agenda to Tackle Future Challenges

¹⁴ Prime Minister Gillard and European Commission President Barosso, Joint media conference, Brussels, 4 October 2010

The Australia-China Special Fund under the ISL program has commenced the process. The Chinese Government has expressed strong support for enhancing the research relationship with Australia, with continuing the Special Fund as a priority.

ISL also supports Australia Unlimited, the program to promote a contemporary image of Australia as a versatile, diverse and innovative nation. The program was launched at the Shanghai Expo, which was supported by the ISL program, showcasing Australia's science achievements including 11 Nobel prize winners, Wi-Fi technology and developing a vaccine for cervical cancer.

KEY FINDING 4.1

The ISL program has been well aligned with Australia's innovation and foreign policy objectives: helping to ensure that publicly funded research is of high quality and supports economic growth, and projecting a sophisticated image of contemporary Australia that can be leveraged for Australia's broader international objectives.





5 APPROPRIATENESS

THE NEED FOR INTERNATIONAL SCIENCE ENGAGEMENT

In 2009–10, the Australian Government released its 10 year Innovation Agenda, *Powering Ideas*, and lifted investment in science and innovation to more than \$8 billion. This investment generates inventions, innovative technologies and discoveries that create wealth, improve the lives of Australians and can be exported to the rest of the world.

Innovation, and research and development, have long been identified by economic analysis as central to economic growth, and more recent empirical studies have served to confirm this link. In its Innovation Strategy, the OECD emphasised¹⁵ the importance of innovation, concluding that it is responsible for driving long term increases in living standards. This conclusion is also reflected in the findings of the House of Representatives Inquiry into Raising the Productivity Growth Rate in the Australian Economy¹⁶, which stated that significant investments in research and development will drive future productivity growth.

The benefits to productivity from business research are intuitively understood. However, the importance to the economy of basic research is worth noting, with many studies showing high rates of economic return on this research, and many private sector innovations flowing from the research and generating substantial spill overs.

Basic research provides a common stock of useful knowledge. Firms and other organisations are then able to draw on the new ideas developed in public research institutions to develop their own new products and processes. Public research develops trained researchers who have skills, background knowledge, access to networks and experience in using the latest research techniques and equipment that can go far beyond the readily available codified knowledge. Importantly in terms of this evaluation, public research institutions can stimulate the flow of knowledge by acting as access points into the international network of knowledge and ideas.

Increasingly, scientific research is becoming¹⁷:

- more globalised – with more countries actively building their scientific capabilities and participating in world science;
- more collaborative – with a growing proportion of projects involving collaboration between investigators from more than one nation; and
- more distributed – with scientific teams collaborating across greater distances and involving more widely dispersed expertise.

The Organisation for Economic Co-operation and Development (OECD) has noted¹⁸ that:

Global challenges are by nature large-scale and complex and need to be addressed collectively at international level through the development of comprehensive solutions and bilateral and multilateral co-operation.

15 OECD (2010), The OECD Innovation Strategy: Getting a Head Start on Tomorrow

16 House of Representatives Standing Committee on Economics (2010), Raising the Productivity Growth Rate in the Australian Economy

17 Allen Consulting (2003), A Study of International Science and Technology Policies and Programs

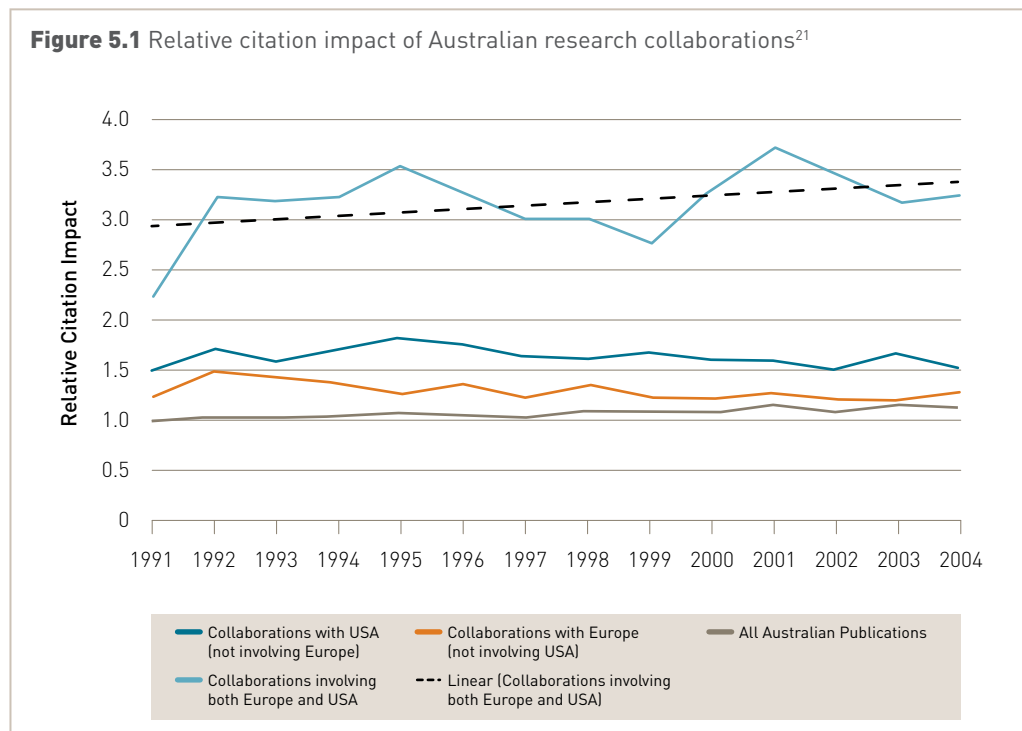
18 OECD (2010), The OECD Innovation Strategy: Getting a Head Start on Tomorrow





While Australia achieves significant science and research outcomes from its substantial investment, some 97 per cent of scientific knowledge is produced outside Australia¹⁹. As we are a small player in the global system, and competing/collaborating with some big and proactive nations, Australia needs effective mechanisms to access the discoveries made elsewhere in the world.

Bibliometric analysis has shown (see Figure 5.1²⁰) that the impact of Australian research, as measured by relative citation rates, is markedly higher for papers that involve bilateral collaboration and co-authoring. Citation rates are higher still for papers involving multilateral collaboration and co-authoring.



19 PMSEIC Working Group (2006), Australia's Science and Technology Priorities for Global Engagement

20 FEAST (2009), A Bibliometric Analysis of Australia's International Research Collaboration in Science and Technology: Analytical Methods and Initial Findings, FEAST Discussion Paper 1/09

21 FEAST (2009), Opportunities for Australian-European Collaboration in Research and Innovation, Presentation to the October 2009 symposium on Advancing Europe-Australia Cooperation in Higher Education

International collaboration builds capacity, facilitates access to new knowledge, attracts foreign investment and extends Australia's global influence. International science engagement is essential to maximise the economic, social and environmental impact of Australian research and to leverage Australia's investment in science and innovation. Collaboration with researchers in other countries provides access to additional expertise and infrastructure and significantly increases the scale and effectiveness of Australia's research effort.

Science engagement with other countries also supports and forms part of Australia's foreign policy, helping to strengthen bilateral and multilateral relationships by broadening the range of economic, social and environmental engagements between Australia and other countries.

These considerations underpin the Government's adoption²² of a National Innovation Priority that seeks to increase international research collaboration by Australian researchers and businesses.

KEY FINDING 5.1

To maximise the economic, social and environmental impact of Australian research, Australia must engage with the international science community and access knowledge, research expertise and infrastructure that is not available in this country.

THE NEED FOR AN INTERNATIONAL SCIENCE LINKAGES PROGRAM

Universities, publicly funded research agencies, businesses and other research organisations all establish international linkages and undertake collaborative activities using their own contacts and resources. Hence, the question arises as to whether or not a specific program, such as ISL, is needed to support international science engagement and realise the objectives of the Government's Innovation Agenda.

The Government has indicated that, consistent with the policy set out in *Powering Ideas*, it will forge closer research relationships with leading players such as China, Europe, India, Japan and the United States²³.

Experience has shown that there are a range of barriers that inhibit the development of robust, enduring relationships with researchers in countries of strategic importance to Australia.

In some cases, meaningful engagement is not possible without an over-arching government to government collaboration agreement being put in place. This is most evident in the case of China. The emergence of China as a research power has only begun, with the OECD²⁴ noting that China's growth in research and development spending exceeds its double digit general

22 Australian Government (2009), *Powering Ideas: An Innovation Agenda for the 21st Century*

23 ALP (2010), *Innovation Policy Statement*

24 OECD (2009), *Measuring China's Innovation System: National Specificities and International Comparisons*, STI Working Paper 2009/1





economic growth. As a significant proportion of China's research and development spend is funded by government sources, effective collaboration with Chinese researchers cannot be achieved without effective engagement at the government to government level.

Australian researchers also face a range of other barriers to international engagement that limit the effectiveness of collaboration at the individual researcher or the institutional level. Examples of these impediments include:

- a lack of awareness and understanding in Australia and partner countries of each other's research capabilities, engagement mechanisms and support programs;
- the difficulty early career researchers experience in obtaining funds for engagement with researchers overseas;
- a lack of funds to support the joint development of collaborative research proposals with researchers in other countries;
- the absence of mechanisms that enable the joint funding of research projects by Australia and the partner country; and
- the lack of funds for Australian researchers to utilise major overseas research facilities that are not available in Australia.

A program such as ISL provides a mechanism to underpin Australia's science and research relationships with priority partner countries and fields of research. Development of strategic relationships with key countries creates a shared agenda for cooperation based on mutual priorities and interests, complementary strengths and common challenges, against which the independent actions of researchers and institutions are likely to be more targeted and hence, more effective. This is particularly important in the crowded landscape of international science endeavour and reinforces the role for Government in managing strategic international science and research engagement.

In addition, Government action can ensure that attention is paid to progressing specific national innovation policy objectives. For example, a program such as ISL can be used to encourage the participation of business and other end users in international research projects of strategic importance.

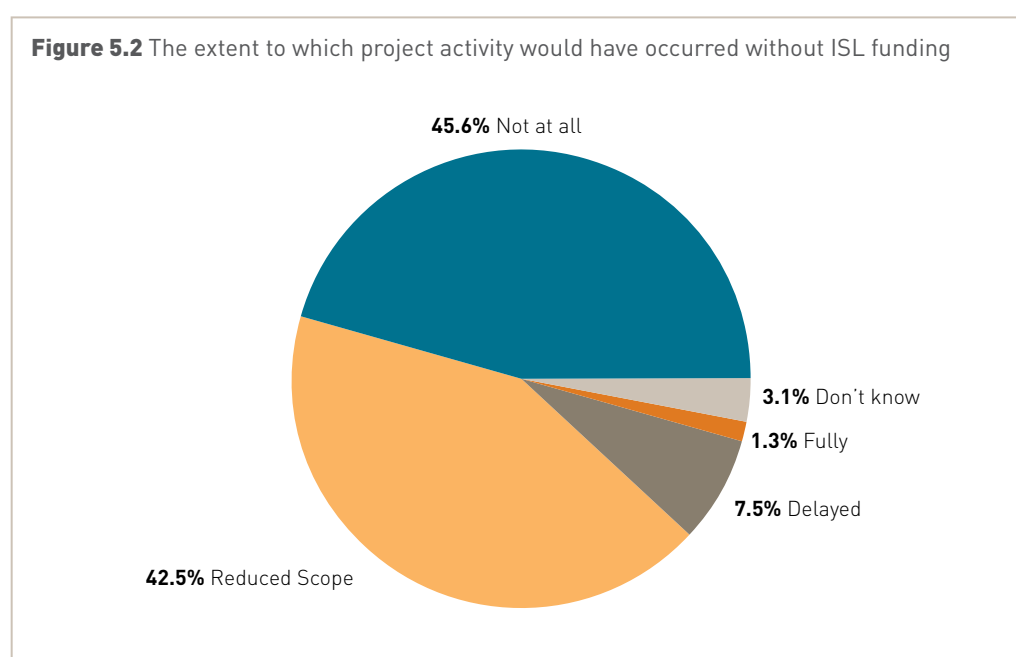
Support for research collaboration creates knowledge spillovers that benefit parties beyond those who undertake the research. As the Productivity Commission stated²⁵:

The strongest case for public support based on spillovers occurs for basic research in science . . . and where businesses are engaged in novel R&D activities

Spillovers not only provide a rationale for public support, but pinpoint other policies that are important in increasing the effectiveness of the innovation system. These include measures . . . that facilitate research cooperation

25 Productivity Commission (2007), Public Support for Science and Innovation, Research Report 03/2007

A survey, conducted by Allen Consulting as part of this evaluation²⁶, asked Australian recipients of competitively allocated grants to indicate the extent to which the project activity would have occurred without ISL funding. Some 88 per cent of respondents indicated (see Figure 5.2) that the activity either would not have occurred or would have occurred with a reduced scope. Only 1 per cent of respondents stated that the activity would have been unaffected by the absence of ISL program funding.



Crucially, Allen Consulting concluded²⁷ that the ISL plays an important role in seeding international ideas exchange and partnerships, thereby acting to facilitate the identification of key areas for collaboration and enquiry. They noted that neither the Australian Research Council nor the National Health and Medical Research Council were designed specifically to facilitate the establishment of new or emergent collaborations, and that while a number of research funding initiatives involve international partners they do not target international engagement as such. Thus they concluded that the ISL fulfils a key complementary role in the funding policy landscape.

A survey of the overseas partners involved with ISL projects²⁸ found that 98 per cent of overseas researchers wished to engage in further collaborative projects with Australian researchers. Furthermore, 97 per cent of overseas partners considered that it was either important or essential that the Australian partner could contribute funds to the project via a program such as ISL.

26 Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of Recipients of Competitive Grants

27 Allen Consulting (2010), Evaluation of the International Science Linkages Program

28 Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of International Collaboration Partners



Success rates for applicants to the competitive components of ISL have been low over the life of the program indicating that there is a high level of demand for funding. Since 2001, the average success rate for applicants to the Competitive Grants, Australia-China Special Fund and FAST has been only 16 per cent, indicating considerable excess demand for funds.

By way of comparison, Allen Consulting reported²⁹ that the success rate for the National Competitive Grants Program run by the ARC in 2008–09 was 20.4 per cent for Discovery Projects.

A program such as ISL can also contribute to the broader development of bilateral relations. In recognition of the economic and political importance for China of the Shanghai World Expo 2010, and taking account of the scale, breadth and potential of the Australia-China relationship, the Australian Government as a whole made its largest investment ever in a world Expo. ISL funding for high-level science related events supported the whole of Government approach and demonstrated to China the importance Australia continues to place on the bilateral science and technology relationship.

The House of Representatives Standing Committee on Industry, Science and Innovation concluded that the evidence received during its Inquiry³⁰ overwhelmingly supported the ISL as a method for supporting international research collaboration and recommended that a successor program be announced as soon as practicable.

In the absence of a program of support for international science engagement, the Government would not be able to build enduring research relationships with countries of strategic importance to Australia. As a result, it would be difficult for the Government to achieve its objective of an Australian innovation system that is closely engaged with global partners. The lack of access to international expertise and facilities would limit the scope and impact of Australia's research effort, thereby reducing the return on Australia's substantial investment in science and innovation.

SCIENCE COLLABORATION POLICIES AND PROGRAMS IN OTHER COUNTRIES

Many of Australia's most important economic partners place a powerful emphasis on the role of science and research in supporting economic growth, and on collaboration with other jurisdictions as a method of leveraging their own investment in innovation.

These countries operate programs with goals that are similar to the ISL (see Appendix E and Box 5.1 for details). The programs are seen by these countries as critical methods of:

- ensuring competitiveness in fields of national and strategic importance;
- leveraging domestic investment in research and development;
- obtaining access to research knowledge and facilities;
- promoting national research and development capabilities; and
- attracting international human capital and investment.

²⁹ Allen Consulting (2010), Evaluation of the International Science Linkages Program

³⁰ House of Representatives Standing Committee on Industry, Science and Innovation (2010), Australia's International Research Collaboration

BOX 5.1

Germany's Strategy for Internationalisation of Science and Research, 2008³¹

Goals:

- Strengthening research cooperation with global leaders
- International exploitation of innovation potentials
- Intensifying cooperation with developing countries in education, research and development on a long-term basis
- Assuming international responsibility in tackling global challenges

Focus:

- Enhance the international mobility of early career German researchers
- Coordination and strategic alignment of national funding programmes to ensure complementarity with international objectives
- Strategic alignment of priorities with those of partner countries
- Through membership of international bodies, develop an "international research agenda" to address global challenges
- Intensify international cooperation in the humanities and social sciences in order to support the globalization and manage its impact on society
- Establish a coordinated presence of German science abroad, including the targeted promotion of higher education, research and innovation in Germany
- Develop a strategy for engagement with Europe and with targeted international partners, with regular review of effectiveness by independent experts.

Most developed countries also support international science engagement by placing dedicated science and technology staff in their embassies to build and maintain science contacts, identify emerging trends and opportunities and to support science collaboration³². Figure 5.3 (based on Lutz-Peter Berg, 2009) shows the number of dedicated full-time science and technology staff engaged by 20 leading countries.

DIISR currently has a total of seven science and technology staff located in Brussels, Washington, Beijing and Delhi, and the Australian Nuclear Science and Technology Organisation has two counsellors based in Washington and Vienna respectively. This places Australia behind most other developed countries in terms of diplomatic staff available to support the building of international science relationships.

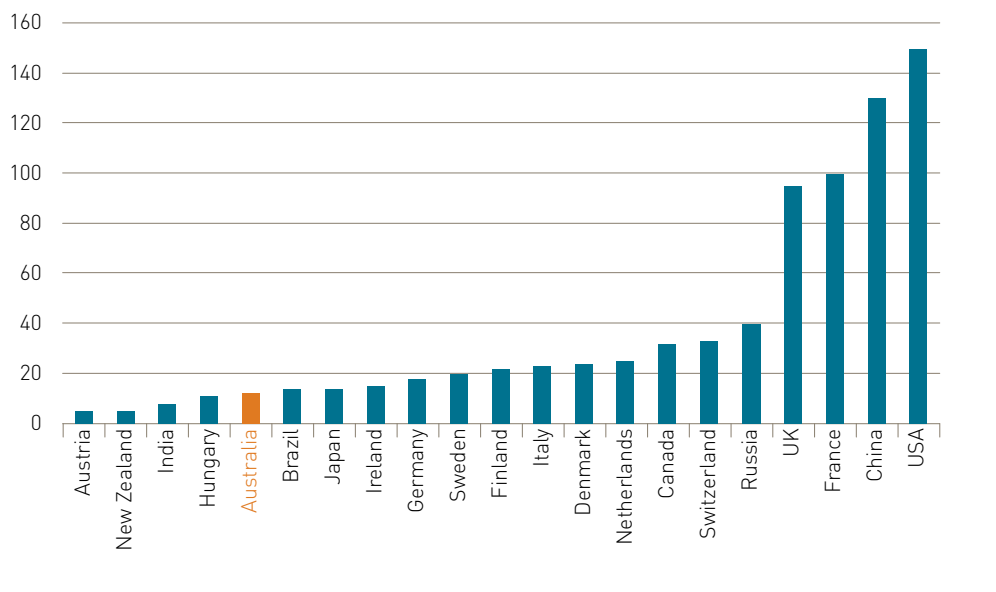
The widespread emphasis by other countries on the use of science engagement programs and science counsellors and staff suggests that governments around the world view their involvement in international research collaboration as a necessary element of innovation policy.

31 Federal Ministry of Education and Research, Germany (2008), Strengthening Germany's role in the global knowledge society: Strategy of the Federal Government for the Internationalization of Science and Research

32 Lutz-Peter Berg (2009), A Comparison of "Science Diplomacy" Networks, Swiss Embassy, London



Figure 5.3 Approximate number of dedicated full time science and technology staff abroad



KEY FINDING 5.2

A government program of science engagement is necessary to improve the return on Australia's science and innovation investment through the development of strong international relationships and the identification of emerging opportunities for collaboration.

PROGRAM DELIVERY

A program that aims to increase international research collaboration should:

- identify national priorities for research collaboration in terms of target countries and fields of research;
- engage at a government to government level with priority countries; and
- progress innovation policy objectives in a whole of government manner.

These considerations indicate that the program should be managed at the national level and that it should be administered by the Department of Innovation, Industry, Science and Research as the agency with portfolio responsibility for innovation policy as a whole.

While other departments pursue bilateral and multilateral agreements in specific thematic areas for which they have portfolio responsibility, the Department of Innovation has primary responsibility for managing intergovernmental science and research relationships across the spectrum. The Department's focus is on the pursuit of broad-based science collaboration at a global level in support of Australia's interests.

The Department has established relationships with stakeholders throughout relevant research and government organisations and is well placed to develop and deliver the program in a consultative manner. The Department is also responsible for related science, research and innovation policies and programs including the National Research Priorities and National Innovation Priorities. Hence, the Department is able to progress international research collaboration as part of the Government's broader National Innovation Policy.

KEY FINDING 5.3

It is appropriate that the Government's international research collaboration program be delivered by the Department of Innovation, Industry, Science and Research (DIISR) in consultation with other relevant government agencies and the research community.





6 EFFECTIVENESS

An assessment of program effectiveness requires consideration of the extent to which the funded activities have resulted in the program's objectives being met.

As stated in Section 2, the ISL's objectives involve increasing participation by Australian researchers in leading edge international research, strengthening strategic relationships between Australian and overseas researchers and facilitating access by Australian researchers to global science and technology.

Allen Consulting concluded³³ that, while the program has a range of objectives, they appear to be well understood and supported by stakeholders.

COMPETITIVE COMPONENTS

The main competitive components of the ISL program are general Competitive Grants, the Australia-China Special Fund and the French-Australian Science and Technology (FAST) Program. An on-line survey of grant recipients under these components was conducted to assess the outcomes and impact of the projects.

A total of 160 responses were received from the 400 grant recipients surveyed, giving an overall response rate of 40 per cent. Those 160 projects involved 4,698 participants (see Table 6.1) indicating that the ISL program has a very substantial reach within the research community and, importantly, that the number of Australian and overseas researchers is evenly matched. Assuming that the survey responses are typical of the project population as a whole, there are likely to have been almost 12,000 participants involved in the 400 competitive projects funded by ISL.

Table 6.1 Total participants in the 160 ISL projects for which survey responses were received³⁴

| ORGANISATION TYPE | NUMBER OF PARTICIPANTS |
|----------------------------------|------------------------|
| Recipient's own organisation | 1,058 |
| Australian partner organisations | 1,273 |
| Overseas partner organisations | 2,367 |
| Total | 4,698 |

Over 80 per cent of survey respondents reported the following benefits from their ISL projects:

- improved expertise, knowledge or quality of work;
- increased number of publications;
- increased number of strategic alliances;
- new or improved international collaborations; and
- increased exposure of their own work.

³³ Allen Consulting (2010), Evaluation of the International Science Linkages Program

³⁴ Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of Recipients of Competitive Grants



In addition, more than 65 per cent of respondents reported achieving the following benefits as a result of receiving ISL funding:

- increased number of citations;
- new or substantially improved processes/techniques/methods;
- new or substantially improved skills; and
- increased exposure to the work of others.

The figures above suggest that ISL funded projects consistently result in strengthened international relationships and improved research capability. These results are in line with a similar survey conducted as part of the 2003 program evaluation³⁵. As a result of their experiences with ISL funded projects, respondents to the 2010 survey expressed the view that the ISL program was very effective in meeting its key objectives (see Table 6.2).

Some 85 per cent of respondents considered that the program met each of four stated objectives to a Good or Very Good standard. On the other hand, only 55 per cent of respondents considered that the program facilitated access to international research funds to a Good or Very Good standard.

Table 6.2 Respondent ratings on achievement of ISL objectives³⁶

| ISL OBJECTIVE | NUMBER OF RESPONSES | | | | | RESPONSE COUNT |
|--|---------------------|------|---------|------|-----------|----------------|
| | VERY POOR | POOR | AVERAGE | GOOD | VERY GOOD | |
| Promoting participation by Australian researchers in strategically focused, leading edge, international research | 0 | 4 | 18 | 50 | 86 | 158 |
| Promoting strategic alliances between Australian and overseas researchers | 0 | 5 | 13 | 42 | 97 | 157 |
| Facilitating Australia's access to the global research community by supporting bilateral and multilateral relations with other countries | 2 | 4 | 16 | 51 | 78 | 151 |
| Assisting Australian researchers in gaining access to international research funds | 8 | 20 | 36 | 38 | 42 | 144 |
| Raising the profile of Australian research and research organisations | 2 | 5 | 19 | 59 | 73 | 158 |

35 Allen Consulting (2003), Evaluation of the Innovation Access Programme – International Science and Technology

36 Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of Recipients of Competitive Grants

Of the three program components surveyed, the Competitive Grants component does not require funding from the partner country. This suggests that the bilateral funding approach employed for the Australia-China Special Fund and FAST has merit in that it ensures funding is provided for both the Australian and overseas partners in the collaboration. Box 6.1 shows an example of a competitive grant project which links Australian research expertise with international partners.

BOX 6.1

Australia-China Centre for Phenomics Research³⁷

Three years ago after extensive government to government consultation, the ISL program and the Chinese Ministry of Science, supported the establishment of the Australia China Centre for Phenomics Research. The key focus of this centre is to strengthen both countries ability to fight disease. The collaborators are exploring the genetics of the immune system to understand what makes us more or less susceptible to infectious disease.

The creation and development of the joint centre was the direct result of the Young Scientist Exchange Program funded by the Australian (ISL) and Chinese governments. The exchanges provided the necessary government sanctioned introductions required by the Chinese before committing to serious discussion about research partnerships.

The bilateral government approval process for the project further reinforced the legitimacy of the researcher relationship and the project. In late 2009 the Phenomics team, both Australian and Chinese, visited BGI (Beijing Genomics Institute) Shenzhen and initiated a potentially lucrative collaborative project. BGI China have an investment support from the Bank of China of US \$1 billion and are installing 25 sequencing machines a month at a cost of \$1M per machine.

Australian research expertise is thereby linked with major international partners and will also benefit from the investment in skills and knowledge made by BGI. *Prima facie* these sorts of relationships mean that Australian discoveries will not only be fostered in a conducive investment environment but will have a fast track to market.

In addition to the benefits that flowed directly from each project, 81 per cent of respondents reported further flow-on benefits such as new research collaborations, staff exchange programs or formal agreements such as a Memorandum of Understanding being implemented between their organisation and the overseas partner³⁸. This strongly suggests that the program is effective in building enduring international research relationships. The Mileura Widefield Array Low Frequency Demonstrator provides an example of sustained international collaboration (see Box 6.2).

³⁷ Australian National University

³⁸ Similar evidence of flow-on benefits was reported in DIISR (2010), Survey of Australia-China Special Fund Stakeholders, unpublished





BOX 6.2

Mileura Widefield Array: Low Frequency Demonstrator³⁹

The Square Kilometre Array (SKA) is a collaborative international astronomy project, currently involving organisations in 20 countries, to build a massive, next-generation radio telescope which will have a total collecting area of approximately one square kilometre. It will operate over a wide range of frequencies and its size will make it 50 times more sensitive than any other radio instrument.

Australia is developing a radio-quiet region centred on Mileura in Western Australia as a candidate site for the SKA, and it is on this site that Australian researchers from The University of Melbourne, together with other leading Australian institutions, have partnered with researchers from the United States to undertake extensive technical and scientific exchange to build the first substantial telescope, the Low Frequency Demonstrator.

ISL funding has facilitated the construction of this telescope, the first of two major telescopes on the site, and has also resulted in 13 papers published in peer-reviewed journals and a formal Memorandum of Understanding (MoU) between the Australian research institutions, the Centre for Astrophysics at Harvard University, Massachusetts Institute of Technology and the Raman Research Institute in India. This MoU further strengthens the already strong and on-going collaboration.

Funding for this project was awarded under the Competitive Grants component of the ISL program.

The ISL grants result in significant financial and in-kind leverage from project participants. The survey of recipients found that 69 per cent of recipient organisations made in-kind contributions to the project, while 71 per cent of recipient organisations made cash contributions to the project.

In addition, the survey found that 71 per cent of the overseas universities with which Australian researchers collaborated made in-kind contributions to the project and 58 per cent made cash contributions.

Box 6.3 provides examples from grant recipients concerning financial leverage and follow-on outcomes associated with ISL projects.

³⁹ Based on project reports held by DIISR

BOX 6.3

Comments by survey respondents concerning the nature of project outcomes⁴⁰

'There are now more than 100 active Australian researchers in the field of organic and dye-sensitised solar cells. We are recognised internationally as a significant entity in basic research and development in the field and in addition managed to unify a number of small and fragmented research efforts in Australia into a national grouping. We were able to use the ISL project to convince State Governments to fund research at a high level, and we are actively working towards the development of a printed flexible solar cells industry in Australia.'

'Access to the very top quality research and researchers in the world has had a transformation effect on our research and international competitiveness. The ISL grant helped put us on the map, resulting not only in increased impact and exposure but also fantastic opportunities for training of research students and postdocs. Breakthrough results, very high impact papers (Nature, Science), and new orders for our technology have been the demonstrable benefits.'

'The project has resulted in the leverage of further applications to funding agencies, and the network of collaborations that this funding has initiated is sustainable and will result in a large number of ongoing high-impact publications, highly trained PhD scholars, and provides for the potential for development of intellectual property in the near future.'

The program can also be an entree into larger funding pools. For instance, the ISL program has enabled some funding recipients to access the EU's Seventh Framework Programme for Research and Technological Development (FP7). With a total budget of 51 billion euros, the FP7 project is the main instrument for funding European research over the 2007–2013 period. A substantial proportion of the FP7 is allocated to research cooperation, including transnational research projects. Between 2008–09 and 2010–11, \$200,000 of ISL funding has been allocated to the Australian Academy of Science to support Australian involvement in the International Research Staff Exchange Scheme (IRSES), which is also funded through the FP7 program.

A separate survey was conducted seeking views of overseas partners associated with competitive ISL projects⁴¹. Around 100 responses were received. The overseas researchers indicated that the benefits they received from ISL projects were very similar to those experienced by Australian researchers, the most common impacts being:

- improved expertise, knowledge, skills or quality of work;
- increased number of publications/citations;
- new or improved collaborations with Australia;
- increased exposure of your own work;
- increased access to facilities/equipment; and
- new or substantially improved processes/techniques/methods.

⁴⁰ Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of Recipients of Competitive Grants

⁴¹ Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of International Collaboration Partners



Comments made by overseas researchers indicated a strong interest in collaboration as Australian researchers are respected by the international community and working together leads to better quality research publications. Overseas researchers viewed the ISL program as a necessary initiative to enable collaboration to occur.

KEY FINDING 6.1

Projects supported by the competitive components of the ISL program have been highly effective in achieving the objectives of increasing the participation of Australian researchers in leading edge international research and strengthening collaborative relationships.

KEY FINDING 6.2

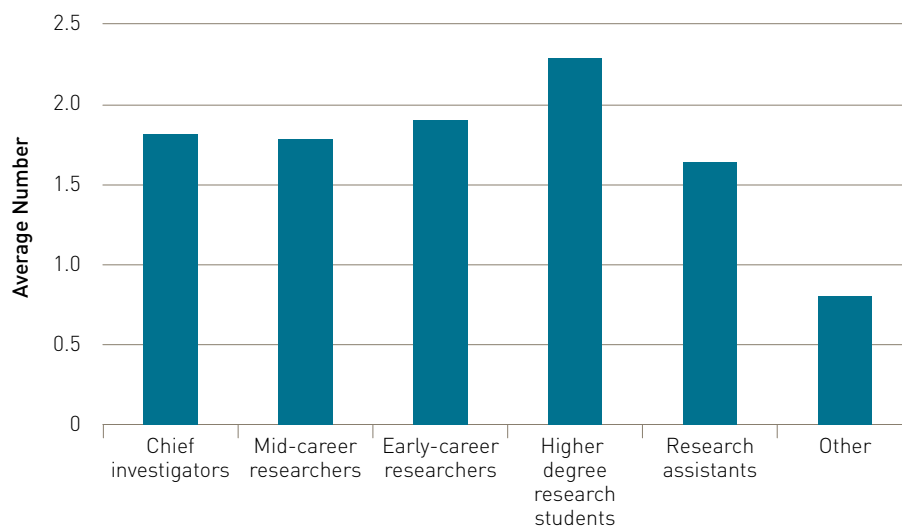
Partner/subject specific bilateral and multilateral granting processes are particularly effective in supporting research collaboration as they ensure funding is available from partner countries.

Some 79 per cent of Australian survey respondents were from universities, with 16 per cent from public research organisations, and 2 per cent each from business and non-profit research organisations. Respondents to the survey of overseas partners comprised 45 per cent universities, 43 per cent public research organisations, 7 per cent non-profit research organisations and 5 per cent from business. As noted in Section 2, 7.6 per cent of competitively awarded ISL grants were received by businesses and industry groups.

While this highlights the spread of organisations involved in the program, it is evident that participation by business is not high. This may, in part, reflect business interest in retaining control of intellectual property. It also may reflect the small scale and pre-project nature of much of the activity funded. Nevertheless noting that the Government is seeking to promote international engagement in research by business as well as the public sector, DIISR should make additional effort to promote awareness of the ISL program to the business sector. As well as direct funding it could involve awareness of opportunities available from collaborative vehicles supported by the ISL such as the 7TH EU partnership framework. In addition, consideration could be given to introducing stronger incentives for business participation as has been done in recent years for the Australia-India Strategic Research Fund.

The survey of Australian grant recipients found that an average of 10.3 staff from the recipient organisation were associated with each ISL project. These staff were evenly spread across categories that included chief investigators, mid-career researchers, early career researchers and research assistants including honours and undergraduate students (see Figure 6.1). This suggests that ISL projects are effective in providing early career researchers with exposure to overseas researchers and international research collaboration (see also comments in Box 6.4). This exposure for younger researchers is important given the links between collaboration and research quality.

Figure 6.1 Average number of participants in ISL projects—recipient's own organisation⁴²



BOX 6.4

Comments by survey respondents concerning the development of researchers

'The numerical techniques we have developed have begun to be applied to areas in addition to the one originally envisaged in the application (seismic imaging). This resulted in new research students being involved and new collaborations with government agencies like Geoscience Australia. Recognition of the work has been received through conference presentations and publications in the peer reviewed science literature.'

'This project also allowed me to trial a research fellow and prime them to win their own ARC Discovery Australian Postdoctoral Fellowship so that they can continue this work under their own steam.'

'Another important aspect of this program is that it provides an inexpensive route for collaboration of young researchers with well established research groups.'

KEY FINDING 6.3

The ISL program has encouraged and supported the involvement of early career researchers in international research collaboration.

⁴² Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of Recipients of Competitive Grants

⁴³ Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of Recipients of Competitive Grants



Successful collaboration begins long before a team develops a competitive proposal for a research project. It requires a sound basis of mutual understanding and trust to have been established which, in turn, requires opportunities for sufficient direct contact between potential partners. This initial contact forms the basis for scoping activities and perhaps a pilot project before a major project of research.

Consultation with stakeholders by Allen Consulting⁴⁴ highlighted a particular issue regarding support for the joint development of research projects with overseas partners. Significant resources are needed to collaborate with an overseas partner on defining and documenting a research proposal before a funding application can be submitted to an organisation such as the Australian Research Council.

A recent study⁴⁵ which investigated costs associated with reaching across academic departments and organisational boundaries to build teams found that the presence of prior social ties supporting links with external team members positively influences commercial outcomes.

In fact, effective research collaboration may involve several stages which might be described as including:

- preliminary engagement with potential partners and identification of opportunities;
- development of a proposal for the funding of an initial research activity;
- conduct of the initial research phase;
- review of progress and development of a proposal for funding the core research activity;
- conduct of the core research; and
- identification of subsequent flow on activities.

Indeed in the case of some countries, such as the United States, with which Australian researchers often already have quite developed relationships, it may be that a greater 'gap' exists with regard to project development (rather than project conduct) and that program support may need to emphasise this issue.

A central aim of ISL funding has been to support those initial, preparatory activities (workshops, exchanges, conferences) which support the collaboration needed to successfully develop high quality joint research projects.

Given the multiple stages involved in research collaboration, Allen Consulting identified⁴⁶ a need for an integrated research life cycle approach to future design and administration of the ISL program.

KEY FINDING 6.4

Science engagement funding needs to support collaboration on the development and/or conduct of joint international research projects which contribute to Australia's competitiveness and productivity.

44 Allen Consulting (2010), Evaluation of the International Science Linkages Program

45 Bercovitz J and Feldmann M (2010), The Mechanisms of Collaboration in Inventive Teams – Composition, Social Networks and Geography, *Research Policy* 2495

46 Allen Consulting (2010), Evaluation of the International Science Linkages Program

STRATEGIC COMPONENTS

Strategic components of the ISL program comprise bilateral strategic investments and multilateral initiatives. These activities largely support the exchange of ideas and relationship building, often through the conduct of workshops and seminars or through staff exchange programs. In the case of multilateral engagement with the OECD, the activities support international collaboration on research policy development as well as research projects.

Strategic engagement with key countries is the starting point for the development of effective collaborative relationships. It is important that such effort is targeted in priority areas and seeks to identify tangible opportunities for cooperation. Box 6.5 provides an example of how strategic policy projects come about through stakeholder consultation to identify areas of complementarity for cooperation. Engagement with key researchers and policy makers from partner countries is essential in order for each country to properly understand the research interests, research capability and collaboration mechanisms of the other. Science Counsellors can play an important role in achieving effective two-way communication on these matters.

BOX 6.5

Australia-China Centre on Water Resources Research⁴⁷

The Australia-China Centre on Water Resources Research was established at the University of Melbourne in March 2006 to enable Australia and China to collaborate on water management challenges.

Water has been a major issue for both Australia and China, especially when it comes to river and groundwater sources being over utilised by agricultural irrigation systems. The Australia-China Centre on Water Resources Research focuses on priority areas of river basin and groundwater management, irrigation water efficiency, water allocation policy, and the linking of climate and catchment models.

The concept for the Centre was initiated at the first Australia-China Symposium on *Living Sustainability*, in Melbourne in October 2004, a collaborative venture, sponsored by the former Department of Education, Science and Training (now Department of Industry, Innovation, Science, and Research, DIISR), the Chinese Academy of Sciences and Ministry of Science and Technology of China.

The key Chinese node of the Centre is at the Institute of Geographic Sciences and Natural Resources Research of the Chinese Academy of Sciences, Beijing while The University of Melbourne houses the key node in Australia.

In addition to ISL funding of \$480,000 the project has attracted \$3.3 million from industry and government agencies in Australia, China, the United Kingdom and the United Nations.

⁴⁷ Based on the June 2010 Progress Report for the project held by DIISR.





As noted in Section 5, Australia has significantly fewer overseas based staff devoted to building science relationships than is the case for most other developed countries. This runs the risk that Australia will be less able to build enduring relationships with countries of strategic importance and less competitive with other developed nations who are increasing their science collaboration effort. Australian diplomatic staff dealing with science will therefore need to maximise their impact by working creatively with the international networks of other Australian stakeholders, such as universities and business.

Initiatives such as workshops held on topics of mutual interest and staff exchanges, even at a relatively junior level, can be the catalyst that is needed to formalise agreement between Australian and overseas partners to establish new alliances and to progress new streams of research. As can be seen from the examples in Table 6.3 strategic engagement of this sort can lead to the establishment of new research projects and Australian participation in major international research groupings.

Table 6.3 Examples of projects funded under the Strategic Component of ISL⁴⁸

| PROJECT | TOTAL FUNDS ALLOCATED (EXCLUDING GST) | KEY ACTIVITIES |
|---|--|--|
| International Square Kilometre Array Steering Committee | \$120,000 over 3 years (\$40,000 per year) | A series of meetings and networking activities aimed to strengthen strategic alliances between countries involved in the project, which involves funding the cost of a telescope. Australia and Southern Africa were short-listed to host the telescope in 2006 (the final decision is expected to be made in 2012). |
| Australia-India Workshop on Nanotechnology | \$30,000 | Workshop participation Establish research linkages between Australia and India Identify projects that could be considered for funding under the Australia-India Strategic Research Fund (AISRF) |
| Australia-Germany Workshop on Water Resources | \$45,000 | Develop research relationship between Germany and Australia in the area of water management and environmental research and development |

⁴⁸ Prepared by Allen Consulting based on information supplied by the Department of Innovation, Industry, Science and Research

| PROJECT | TOTAL FUNDS ALLOCATED (EXCLUDING GST) | KEY ACTIVITIES |
|---|---|--|
| European Molecular Biology Laboratory (EMBL) Australia | DIISR and VIC DIIRD are overseeing operational costs, while the universities involved and CSIRO and NCRIS are contributing towards other expenses. Contribution by DIISR: \$51,337 | This partnership saw Australia being granted EMBL Associate Member status for a period of seven years. This is one of the larger scale projects that have resulted in outputs and outcomes such as: <ul style="list-style-type: none"> ■ Award of a \$95 million grant to The University of Sydney for a building which will incorporate the Sydney node of the EMBL Partner Laboratory network ■ The securing of funding from various institutions; ■ Completion of laboratory space for research groups at Monash University |
| Singapore-Australia Workshop on Energy-Related Issues | \$50,000 | Workshops and presentations, which aimed to foster dialogue between the two nations. The program also aimed to identify complementary skills between Singaporean and Australian researchers, which could lead to future research. Follow up meetings were not possible due to uncertainty in funding from the Australian side. |
| CSIRO-University of Diego Portales, Chile Collaboration | \$18,000 | The workshop aimed to identify potential areas of collaboration in minerals and mining research, leading to a joint bid to the multi-million dollar Chilean international Centres of Excellence program (final outcomes yet to be announced). |

Australia's multilateral science engagement has primarily been via the OECD's Committee for Scientific and Technological Policy and especially its associated Global Science Forum (GSF). ISL funds have enabled Australian researchers to participate in GSF projects and effectively allowed Australia to 'buy in' to large multilateral research projects such as the global earthquake model and data integration for research into the built environment.

In the absence of strategic engagement of this sort, Australia and its international partners would not have established the base level of common understanding that is needed to build strategic research relationships, and Australia would forego opportunities to participate in major research collaborations.





KEY FINDING 6.5

Strategic engagement with priority partner countries is essential to underpin the development of effective international research relationships.

The 2003 evaluation of the program⁴⁹ noted that the Showcasing component (which operated until 2006) aimed to maximise the impact of Australia's presence at major international showcasing events. While there does not appear to be a strong call for the re-instatement of a separate component for this type of support, showcasing events are necessary and can be funded under the Strategic component of ISL.

The successful Australia China Science and Technology Week, held as part of the Shanghai World Expo in August 2010, was funded in this manner. The Science Week events involved over 200 eminent scientists and senior officials from 93 lead science agencies in China and Australia. Coinciding with celebration of Australia's thirty year science and research engagement with China, this initiative promoted Australia as technologically innovative and a strong research partner for the future, and facilitated groups of eminent Australian and Chinese scientists and researchers meeting to consider future collaboration in areas of national importance.

Australia's research priorities, capabilities and collaboration mechanisms do need to be communicated effectively to our international partners. The Government's strategy for science engagement, *Inspiring Australia*, recommends showcasing of Australia's science capability both domestically and abroad⁵⁰. Similarly, Australian researchers need to be aware of the potential to pursue research opportunities with overseas partners.

Science Counsellors and other staff located overseas play an important role in achieving communication and awareness raising of this sort. However, their efforts need to be conducted within an international research collaboration framework that sets out Australia's objectives and strategies, and is supported where necessary with investment in strategic communication activities.

KEY FINDING 6.6

Two-way communication and awareness raising activities are a necessary part of Australia's strategic international research collaboration framework.

⁴⁹ Allen Consulting (2003), Evaluation of the Innovation Access Programme – International Science and Technology

⁵⁰ Steering Committee for a National Science Communications Strategy (2010), *Inspiring Australia: A national strategy for engaging with the sciences*

SUB-CONTRACTED COMPONENTS

The sub-contracted components of the program comprise the ideas exchange and relationship building activities administered by the four Learned Academies and the support for access to overseas research facilities, currently administered by ANSTO.

A study⁵¹ commissioned by the Australian Academy of Science (AAS) into the impact of their ISL funded international staff exchange programs found that:

- 91 per cent of recipients reported that collaboration with their international partner was still continuing;
- 89 per cent reported that their research had a more international focus after receiving the grant;
- 74 per cent acquired knowledge and technology that they transferred to their home institution; and
- 67 per cent reported jointly authored publications, with 26 per cent expecting further publications in the future.

A self assessment⁵² by the Australian Academy of Technological Sciences and Engineering (ATSE) of their ISL funded activities reported that 26 of the 27 international workshops conducted under the program have resulted in the subsequent establishment of a successful institutional collaborative linkage, with 12 of the workshops reporting multiple collaborations within 12 months.

The science academies have been effective in administering research collaboration as they can draw on the each academy's respected international status and linkages with other academies around the world, plus the combined expertise and networks of Australia's most outstanding scientists from all major institutions.

The activities managed by the Academy of the Social Sciences in Australia and the Australian Academy of the Humanities have only commenced funding projects in 2009 and it is too early to assess their effectiveness in building long term international collaborations. Their initial activities have, however, been heavily oversubscribed suggesting there is strong demand for international collaboration in these fields of research. The strategic opportunities enabled by the ISL program have allowed the academies to engage in new bilateral discussions with counterparts in Europe, China and Taiwan to facilitate collaborations with Australian humanities, arts and social science researchers.

The expertise that is accessed via the Academies and their members also provides valuable input into strategic priority setting for the ISL program.

ANSTO, and in earlier years the University of Sydney, have managed a program of grants supporting travel by Australian researchers to utilise major research facilities that are not available in Australia. To be eligible for funding from ANSTO, a researcher must already have been granted time at one of 50 or more eligible facilities around the world. The assessment criteria focus particularly on providing support for graduate students and early career researchers.

51 Foursight Associates (2009), Review of the International Exchange Programs of the Australian Academy of Science

52 ATSE (2010), Impact of the ISL-Science Academies Program, A Five Year Self Assessment





Under these arrangements, more than 1,300 researchers have accessed facilities in 19 countries including synchrotron radiation sources, high flux neutron beam sources, high energy physics facilities and astronomical facilities.

This funding also allows researchers to take advantage of multi-year subscriptions that enable Australian access to a number of major international research facilities that are funded by the ARC under their Linkage, Infrastructure, Equipment and Facilities (LIEF) scheme.

BOX 6.6

Access to High Energy Physics Research Facilities

Until mid 2009, ISL funding was provided to The University of Sydney to run the Access to High Energy Physics Research Facilities program. This funding was used to support Australian researchers using the facilities at CERN in Geneva and KEK in Japan. Funding was used to pay for travel and accommodation costs of Australian researchers to participate in research projects at these facilities. Australian participation in CERN and KEK was also made possible as a result of LIEF funding an Australian subscription to the facilities.

Prior to ISL funding becoming available, Australian researchers would only use these facilities during 'suitcase visits'. That is, funding was provided on a trip by trip basis, and would only cover enough time to gather the necessary data for analysis in Australia.

The ISL funding made it possible for Australian scientists to become part of the research teams at CERN and KEK, and become involved in the setting up and maintenance of experiments, instead of just using the data. This has made the involvement of Australian scientists in these experiments more valuable.

As a result of Australian experience in these experiments, a new ARC Centre of Excellence for Particle Physics at the Tera-Scale has been approved and is due to start in early 2011. This Centre of Excellence will be involved in the ATLAS experiment at CERN. It is unlikely the Centre of Excellence would have received funding without the prior experience of participating scientists visiting the facility.

KEY FINDING 6.7

The sub-contracted components of the ISL program have been able to draw on the expertise and networks of the administering organisations to achieve effective delivery of the Academies' Program and to provide access for researchers to overseas research facilities.

53 Allen Consulting (2010), Evaluation of the International Science Linkages Program. Based on consultation by Allen Consulting with the University of Sydney

7 EFFICIENCY

An assessment of program efficiency involves determining whether the program is administered and delivered in an efficient manner, and whether the program represents good value for money.

For the ISL program as a whole, the cost of managing the program (Departmental expenses) compared with the value of the grant funding provided to recipients (Administered expenses) is around 8 per cent (see Table 7.1).

In 2009–10, the figure was 10 per cent due to the grant funding for that year being reduced from \$12.07 million to \$10.07 million. If that reduction had not occurred, the ratio of Departmental to Administered expenses for that year would have been 8.4 per cent.

Table 7.1 ISL Program – Departmental and Administered Expenses⁵⁴

| YEAR | SALARIES (\$) | NON-SALARIES (\$) | TOTAL DEPT EXP (\$) | TOTAL ADMIN EXP (\$) | DEPT/ADMIN (%) |
|---------|---------------|-------------------|---------------------|----------------------|----------------|
| 2007–08 | 883,000 | 10,000 | 893,000 | 11,444,292 | 7.8 |
| 2008–09 | 921,000 | 10,000 | 931,000 | 11,677,999 | 8.0 |
| 2009–10 | 998,000 | 10,000 | 1,008,000 | 10,069,998 | 10.0 |

Note: Administered expenditure in 2009–10 was reduced by \$2 million as a result of a 2009–10 Budget savings measure.

These figures are comparable with the findings of the 2003 evaluation⁵⁵ which reported the cost of program delivery to be 6 to 8 per cent. As the program currently manages hundreds more projects than was the case in 2003, it would appear that administration of the program is at least as efficient as was the case in its early years of operation.

Activities such as ARC funding and the National Collaborative Research Infrastructure Strategy (NCRIS) can spread fixed overheads across programs worth \$100 million or more per year. These large programs typically operate with a ratio of Departmental to Administered expenses of around 3 per cent^{56 57}.

With Administered expenses of some \$10 to \$12 million per year, the ISL is not a large program. By its nature, the ISL involves the provision and management of a large number of relatively small grants, which often require significant time and effort in order to build consensus and progress collaboration. As a result, the ISL does not have access to the same economies of scale as larger programs. Given the characteristics of the program, the level of administrative expenditure is appropriate.

This conclusion was shared by Allen Consulting⁵⁸ who noted that, on balance, the administrative costs are not excessive given the relatively small size of the program and the complexities of its administration.

⁵⁴ Estimates prepared by DIISR

⁵⁵ Allen Consulting (2003), Evaluation of the Innovation Access Programme – International Science and Technology

⁵⁶ ARC (2010), Annual Report 2009–10

⁵⁷ DIISR (2010), National Collaborative Research Infrastructure Strategy Evaluation Report

⁵⁸ Allen Consulting (2010), Evaluation of the International Science Linkages Program



KEY FINDING 7.1

The overall level of administrative expenditure on the ISL program provides value for money given the nature and scale of the program.

COMPETITIVE COMPONENTS

The survey of competitive grant recipients⁵⁹ indicated that the majority of respondents were satisfied with the efficiency of the program and rated the application process, processing time and reporting requirements as Good or Very Good.

However when asked about areas in which the program needs improvement, 51 per cent nominated the reporting requirements as needing improvement and 37 per cent nominated the application process.

Comments provided by respondents as part of the survey were frequently complimentary about the administration of the program, while others were critical. In particular, the following issues were identified:

- the administration of the grants is too rigid and bureaucratic;
- the range of cost items that can be funded is limited;
- the level of compliance costs, including reporting, can outweigh the value of the grant; and
- the administrative costs for recipients are particularly onerous with respect to small grants of around \$20,000 or less (noting that funding is not provided to support the recipient's administrative costs).

Allen Consulting concluded⁶⁰ that the efficiency of the program could be improved with some re-design and a more focused approach. Taking the quantitative responses and the supplementary comments together, it would appear desirable to streamline the administrative arrangements for the program while still ensuring appropriate accountability for use of the funds. In particular, the nature of the application, assessment, contracting and reporting arrangements should reflect the scale and risk associated with various grant types. Changing the administrative arrangements in this way is likely to lead to significantly reduced compliance costs for some classes of grant recipients.

KEY FINDING 7.2

Consistent with best practice program management, application, assessment, contracting and reporting arrangements for funded activities need to reflect the scale, risk and other features associated with the respective grant type.

59 Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of Recipients of Competitive Grants

60 Allen Consulting (2010), Evaluation of the International Science Linkages Program

STRATEGIC COMPONENTS

In progressing the strategic engagement activities, Departmental staff are not merely administering grant funding agreements.

Rather, the Department works with stakeholders, both domestically and internationally, including with counterpart agencies of foreign governments, to identify priority activities, determine project objectives and plan collaborative projects. In effect, the Department is often working as a partner in the project and this necessarily requires a higher level of Departmental effort.

As a result, the Departmental expenses associated with these activities reflect costs associated not only with administration, but also with project conduct.

While it is difficult to estimate the resources involved, a raw ratio of Departmental expenses to Administered expenses for the strategic components is likely to be about 25 per cent. However, this is not a valid measure of administrative efficiency due to the dual nature of the costs incurred.

Nevertheless, DIISR should continue to scrutinise the costs incurred for these components of activity and seek to introduce efficiencies where possible.

SUB-CONTRACTED COMPONENTS

DIISR currently sub-contracts administration of ISL components to five organisations: the four Learned Academies and ANSTO.

The program's practice of using the Learned Academies and ANSTO to manage contracted aspects of the program ensures that existing top level networks and links with the international science community are utilised. There is a direct benefit to Australia because the program is leveraging existing relationships and linkages, which contribute to the efficiency and effectiveness of the program investment.

The funding agreements with the AAS, ATSE and ANSTO each provide for up to 8 per cent of the funds to be applied to administrative expenses. In recognition of the additional costs associated with the start up phase of their activities, the Academy of the Social Sciences in Australia and the Australian Academy of the Humanities are able to apply up to 12 per cent of funding to administration.

Consistent with the findings of the 2003 evaluation⁶¹, Allen Consulting concluded as a result of its recent consultations⁶² with stakeholders that:

There is also clear evidence that the bodies administering the subcontracted components to varying extents cross-subsidise the ISL programs they administer, including through pro bono contributions.

All the Learned Academies and ANSTO absorb the administrative costs they incur above those allowed under their contracts with DIISR.

Again, DIISR should continue to scrutinise the administrative costs associated with these activities to ensure that management of the activities is efficient and effective.

61 Allen Consulting (2003), Evaluation of the Innovation Access Programme – International Science and Technology

62 Allen Consulting (2010), Evaluation of the International Science Linkages Program





8 INTEGRATION

AUSTRALIAN ENGAGEMENT IN INTERNATIONAL RESEARCH COLLABORATION

A number of Australian Government organisations engage in activities that support international science engagement. As shown in Appendix F, some of these activities are managed within the Innovation portfolio while others are managed by various other portfolio areas.

These activities are diverse in their objectives and method of operation, with no single approach predominating. Within the Innovation portfolio, the Australian Research Council (ARC) supports the highest quality research and research training through national competition for grant funds, while the research agencies (CSIRO, ANSTO and AIMS) use science to deliver innovative solutions for business, society and the environment. As would be expected, activities managed in other portfolios pursue objectives that relate to the role of the respective portfolio. For example, AusAid operates within the Foreign Affairs and Trade portfolio to assist developing countries to reduce poverty and achieve sustainable development.

A range of other organisations also undertake activities that support international research collaboration (see Appendix F). These include:

- higher education institutions;
- Learned Academies;
- State and Territory Governments; and
- business.

Box 8.1 provides an example of the way in which ISL funding can complement the activities of other Government agencies.

BOX 8.1

CSIRO working with the ISL program

CSIRO is taking an active role to further develop and strengthen its ties with key European institutions and governing bodies. CSIRO formed part of a high level Australian delegation to the bilateral Joint Science and Technology Coordination Committee meeting held in Brussels during 2008. The meeting formed the basis for the development of the Australia-Europe Roadmap document by the Australian Government and European Commission. This document maps priority areas for engagement with Europe and the most appropriate mechanisms to achieve strengthened collaboration.

As a direct consequence of CSIRO's involvement in the establishment of the roadmap, CSIRO was able to secure Australia-Europe research collaboration funding from International Science Linkages (ISL) to launch a pilot twinning program. This will support higher level engagement between CSIRO and its EU Framework Programme consortium partners, initially in the areas of food, biotechnology and agriculture research.

63 CSIRO (2009), Report on CSIRO International Engagement 2008/09





There is also evidence that ISL collaboration grants complement research funding by the ARC. As part of the evaluation, the ARC examined around 360 researchers who had received ISL funding and found that some 50 per cent also received ARC grants. A subsequent survey conducted by the ARC of 184 ARC grant recipients found that, for 70 per cent of respondents, at least some of their ARC grants related to the purpose of their ISL grant.

As Allen Consulting concluded⁶⁴, this suggests that the research being conducted by ISL recipients is of high quality and provides confidence that, if ISL funding was increased substantially, the benefits gained from the program would increase proportionally.

COORDINATION OF AUSTRALIAN RESEARCH COLLABORATION ACTIVITIES

In delivering the ISL program, DIISR liaises with key Australian stakeholders including other government agencies, research organisations, business representatives and the Learned Academies. While the relationship with the Learned Academies is formalised and ongoing as a result of their role as sub-contractors, consultation with other stakeholders is generally based on need, and is of an informal nature.

Strengthening of these consultative arrangements would provide DIISR with stronger and more complete input into:

- the identification and updating of priority partner countries and fields of research;
- the codification of the processes by which these strategic priorities are determined;
- the positioning of activities so as to fill program gaps while avoiding duplication of activities; and
- where necessary, the coordination of administrative processes to ensure efficient program delivery.

Noting that effective specification of research priorities and countries is important to the success of the program, a more structured consultation process should improve codification within DIISR as to how strategic priorities are established.

The inclusion of business representatives and industry research organisations in this consultative process would help to increase awareness of the program within the business sector.

The consultative process would also provide a framework for interaction with the Department of Foreign Affairs and Trade and Austrade, as well as with the promotion of Brand Australia.

KEY FINDING 8.1

A more structured engagement with key Australian stakeholders would strengthen the setting of strategic priorities and ensure that research collaboration activities are being delivered in a complementary and coordinated manner.

64 Allen Consulting (2010), Evaluation of the International Science Linkages Program

The ISL Program has provided support for activities that are either not funded through ARC and NHMRC sources or else are unlikely to receive support from those sources. Researcher exchange activities such as the Australia-US Summer School Program, the Australia-Singapore Emerging Researcher Leaders Program and the Australia-China Young Scientist Exchange Program would not be supported by ARC or NHMRC and would, in the absence of ISL, not have received funding.

Similarly conferences and symposia, such as the highly regarded Australia-China Academies Symposia, would otherwise be unlikely to have developed.

ISL has provided early career researchers with an important entry into competitive grants programs and thereby helped them to build the track records which they require to be competitive in ARC and NHMRC and international grant programs.

The ISL's bilateral initiatives such as the Australia-China Special Fund provide the only available mechanism (apart from the Australia-India Strategic Research Fund) to establish a joint research project with access to funding from both Australia and a partner country via a single program. Other elements of ISL, such as the strategic and sub-contracted components also address otherwise unmet needs.

In March 2008, the Government announced⁶⁵ a number of changes to the ARC's programs that aimed to support increased international collaboration. Among other things, the changes removed the restrictions on the use of ARC funds for travel for international collaborators.

Under NHMRC's Project Grants scheme, applicants may request funding to support specific research activities to be undertaken overseas. In doing so the applicants must clearly demonstrate that the research activity is critical to the successful completion of the project and the equipment/resources required for the research activity are not available in Australia.

It is important to note that the ARC and NHMRC schemes only provide support for international collaboration activities that are specific to, and occur as part of, the research project.

ISL on the other hand has provided support for activities that lead to the establishment or further development of collaborative links. ISL has also supported activities of a more exploratory nature that typically take part in the pre-project phase of collaboration.

The ISL program has not run new funding rounds for general Competitive Grants in 2009 or 2010. Given that ARC grant recipients now have increased flexibility to use their funding for international collaboration, there would arguably be some overlap between ARC funding and the general Competitive Grants component of the ISL program.

ARC funding supports international collaboration that is specific to a research project – by comparison, ISL funding is supporting the establishment or development of collaborative links which might subsequently contribute to a project that is funded by the ARC. Alternatively, ARC-funded research can open up new avenues for collaboration, which can be seeded with ISL support. While the two programs both support international engagement, they are highly complementary.

65 Senator the Hon Kim Carr (2008), Media Release: ARC Fellowships to Become More International, 26 March





By funding collaborative activities which subsequently contribute to a project that is funded by the ARC, NHMRC or an overseas research funding body, the ISL plays an important complementary and synergistic role in the national science and research system.

As Allen Consulting concluded⁶⁶, other than the ISL (and the Australia-India Strategic Research Fund) no Australian Government programs have the establishment and strengthening of international research collaboration as their primary focus and the ISL program therefore fills a gap not covered by other initiatives.

KEY FINDING 8.2

The ISL program continues to be positioned in a way that supports international research collaboration without duplicating other Australian research collaboration activities.

INTEGRATION WITH OTHER COUNTRIES

Stakeholder consultations and the survey of overseas partners conducted as part of this evaluation indicate that the ISL program generally aligns well with objectives and programs in other key countries⁶⁷. Canberra based staff working for the United States, Japan, France and the European Union (EU) Delegation commented about the need for Australian researchers to have access to their own funding for collaboration, and about the usefulness of the ISL program in initiating or building on existing research relationships.

Comments provided by overseas respondents to the Allen Consulting survey⁶⁸ indicated a strong desire to collaborate with Australian researchers and strong support for the ISL as an appropriate mechanism to foster international research collaboration.

Feedback on the importance of international science engagement supported by the ISL, was also provided by a number of overseas missions of the Department of Foreign Affairs and Trade, noting strong support from host governments and institutions.

For example, the European Commission (EC) advised that the role of programs such as the ISL were essential for supporting engagement by third countries, such as Australia, in the EU's 51 billion euro Framework Programme for Research and Technological Development. The EC noted that Australia is a long way from Europe and needed to work to build and maintain its research profile, particularly given the EU's strong focus on new member states, developing countries, major global research players, such as the United States and Japan, and emerging powers such as China, India and Brazil. A program like the ISL was seen as providing the necessary funding support to build on commitments by government to strengthen the Australia-EU research and innovation relationship.

⁶⁶ Allen Consulting (2010), Evaluation of the International Science Linkages Program

⁶⁷ Allen Consulting (2010), Evaluation of the International Science Linkages Program

⁶⁸ Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of International Collaboration Partners

BOX 8.2

Australia-Europe ICT research network building critical mass and international profile for Australian ICT excellence⁶⁹

The ISL supported National ICT Australia (NICTA) to establish an Australia-Europe ICT research network to foster links with Europe, raise awareness of Australia's ICT research excellence and support researcher and student exchange. The network is now focused on the longer-term goal to increase Australian ICT participation in European Commission (EC) Framework Programmes and Joint-Technology Initiatives.

ICT researchers in Australia are gaining critical mass and visibility in Europe, a crucial factor in international collaboration. The Australia-Europe ICT research network has brought together research, industry and government to promote Australia's ICT research strengths. This network is also drawing on the international track-record, networks and experience of Australia's corporate research laboratories such as Cochlear and Resmed and Australian based European corporate research facilities such as SAP Research that deliver global products based on Australian ICT excellence and university relationships.

The ISL Program supported an Australian delegation of more than 30 researchers and the Australian ICT capability stand at the ICT Event: Digitally Driven – the European Commission's ICT research event held every two years – in Brussels September, 2010 to showcase world-class Australian research to potential partners in industry and research. Support from the ISL has enabled the ICT research sector to work together, target opportunities and leverage additional project funding from the EC. Through the ISL grant, NICTA has leveraged more than \$100,000 from the European Commission International Relations unit to support our network and to undertake a capability study.

Feedback from Beijing highlighted the value which China places on its science relationship with Australia and noted the success of the ISL-funded Australia-China Special Fund and the Young Scientist Exchange program, both seen as critical for fostering closer connections between scientists in Australia and China and supporting innovative joint research projects, several of which had evolved into more substantial long-term joint research centres.

The Chinese Government particularly emphasised the hope that Australia would continue and even increase its commitment to funding bilateral science cooperation into the future. China commented that Australia is viewed as a key bilateral partner for science and research in a range of priority areas such as climate change, the environment, agriculture, mining and energy, biotechnology, nanotechnology and astronomy. Chinese officials and academics expressed the view that the bilateral science program with Australia was regarded as a model for international cooperation.

⁶⁹ Provided by NICTA





The German Government, too, strongly supported a continuation of the ISL program, noting that collaboration partners have directly benefited from the ISL and were keen to see the Australian-German collaboration relationship continue. The ISL is valued as a means of facilitating contact and building long term links between Australian and German scientists and institutions. Germany would be pleased to see the establishment of a permanent bilateral mechanism for fostering deeper scientific collaboration with Australia.

KEY FINDING 8.3

The ISL program's activities are well integrated with the objectives and programs in partner countries.

The nature and extent of integration between research collaboration in Australia and a partner country can be considered at two levels: first, in terms of policy and strategic alignment and, second, in terms of administrative coordination and simplicity.

Collaborative relationships are likely to be more effective and enduring where the research activities are of strategic importance to both the Australian and overseas partners. Again, this would support the trend in recent years for the ISL program to move away from general funding rounds towards processes that involve an emphasis on priority areas for research that are agreed between Australia and the partner country.

Bilateral and multilateral research collaboration programs provide a mechanism for countries to set out common research priorities and to focus activity primarily in those areas. Science Counsellors and other staff located overseas can play an important role in clarifying and communicating these priority interests.

KEY FINDING 8.4

Bilateral and multilateral research collaboration should emphasise agreed research areas that are of strategic importance to Australia and the partner country.

As noted earlier, bilateral and multilateral research funds fill a particular need as they provide a mechanism whereby a research project can obtain access to funding from both Australia and an international partner via a single program. In principle, there are at least three ways in which such an arrangement might be managed:

- Australia and the international partner each run a competitive funding round in their own jurisdiction and then agree to fund projects that rank highly in both countries;
- Australia and the international partner run a single, jointly managed funding round that assesses applications from the perspective of each country; or
- where a thorough assessment of project quality has been conducted as part of a selection process by the international partner, the ISL program could provide a relatively automatic funding approval subject to some limited checking of the Australian partner and the project.

The first of these approaches is the most resource intensive as it involves the research partner in each country submitting a separate application to be considered as part of the selection process conducted in each country. While the other two approaches may each offer a simpler, more coordinated mechanism, the final choice of assessment process will need to take into account the preferences and requirements of the administering agency in the partner country.

Funding mechanisms that support research collaboration should be coordinated in a way that minimises the overall administrative complexity and cost to researchers and governments in Australia and the partner country.





9 PERFORMANCE ASSESSMENT

PERFORMANCE ASSESSMENT FRAMEWORK

Effective management of a grant funding program requires that information is gathered to ensure appropriate compliance by each grant recipient with the terms and purpose for which the funds are provided, and to assess the outputs and outcomes for each project and for the program as a whole.

Mechanisms for meeting these information needs include regular informal contact between Departmental staff and the grant recipient, the provision of written reports by the recipient and periodic surveys, reviews and evaluations initiated by the Department.

In the case of the ISL program, each competitive grant recipient is required to provide annual progress reports, a final report and a follow-up report for their project one year after completion of the project. The progress report and final report each provide information on compliance and performance. The follow-up report is specifically intended to gather information on the medium term outcomes from the funded project.

Recipients are required to provide information that enables DIISR to report on the following ISL key performance indicators (KPIs):

- for collaborative research projects
 - percentage of collaborative research projects completed in 2010–11 that resulted in papers being accepted for publication in peer-reviewed journals or in conference proceedings, or that resulted in other follow-up activities such as new collaborations, patents, products, services or applications of technology; and
 - percentage of collaborative research projects completed in 2010–11 that reported strengthened international relationships as a result of the project.
- for networking and relationship building activities
 - percentage of networking and relationship building activities completed in 2010–11 that reported strengthened international relationships as a result of the activity.

Various components of the ISL program have been reviewed during the life of the program and the program as a whole was evaluated in 2003. The recommendations of those reviews have largely been implemented, including the renaming of the program that occurred in 2004.





SURVEY RESULTS

The survey of Australian grant recipients⁷⁰ found that 52 per cent of respondents considered that the efficiency of the reporting requirements was Good or Very Good, while 19 per cent of respondents considered the reporting efficiency to be Poor or Very Poor.

Some of these respondents would have experienced older reporting requirements that have since been streamlined to some extent. For example, progress reports are no longer required for low value FAST and China Fund grants. Nevertheless, the survey results and the open-ended comments made by some respondents regarding their belief that the reporting is excessively onerous, suggest that there is room to improve the reporting arrangements.

Overall, Allen Consulting concluded⁷¹ that most administrative effort by funding recipients appears to be directed towards conformance and financial compliance rather than performance.

REVIEW OF PERFORMANCE ASSESSMENT

The compliance and performance monitoring arrangements appear to have been quite effective in meeting management needs, but a review of the program's reporting arrangements should be undertaken.

In reviewing compliance reporting, it would be desirable to take into account materiality and risk management while still ensuring there is appropriate accountability for the use of public funds. In particular, it would be desirable to consider the level and nature of compliance reporting that is appropriate for small grants of less than, say, \$20,000.

With the implementation of 'Operation Sunlight', the Government's reform agenda to improve the openness and transparency of public sector budgetary and financial management, program KPIs became more outcomes focused and reporting templates were revised to capture information such as publications, patents and new collaborations that could demonstrate success against the objectives of the ISL program.

However, more work is needed to review and refine performance measures and the way in which data is captured. Measures need to reflect the nature of the research enterprise and capture meaningful indicators of the value of collaboration. Key indicators would include:

- the number of research collaborations with strategic international partners and their outcomes;
- the quantum of international and domestic in-kind and financial contributions including dollars leveraged through partnership arrangements;
- the contribution to National Research and Innovation Priorities; and
- the increase in number and impact of jointly authored publications and joint activities such as conferences and seminars.

70 Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of Recipients of Competitive Grants

71 Allen Consulting (2010), Evaluation of the International Science Linkages Program

The indicators should be easy for grant recipients to report and be consistent with the measures used to assess domestic research performance. When examining the reporting arrangements, issues to be considered include:

- the extent to which performance information should be gathered via reports from recipients, or from periodic review of the program initiated by the Department; and
- given the nature and scale of the funded projects, the extent to which measures of project outcomes should be incorporated in payment milestones under the funding agreement.

For a program of this sort, performance monitoring should desirably occur at three levels:

- at the project level where the outputs and outcomes of an individual project need to be determined – this is generally addressed via reports from grant recipients;
- in terms of progress with developing a particular bilateral or multilateral relationship – this may be addressed via annual consideration of the state of the relationship; and
- for the program as a whole – this would normally be addressed via a periodic program evaluation.

Performance outcomes for individual projects can take some time to materialise. For this reason it may be appropriate to consider follow-up reporting of outcomes beyond the current one year follow-up period. Balancing compliance against enhanced awareness of performance suggests that follow-up of outcomes would be desirable for a stratified sample of funding recipients three years after completion of the grant.

KEY FINDING 9.1

The ISL performance assessment arrangements have generally been effective in meeting conformance and performance monitoring needs, but there is scope to improve the relevance and collection of performance information.





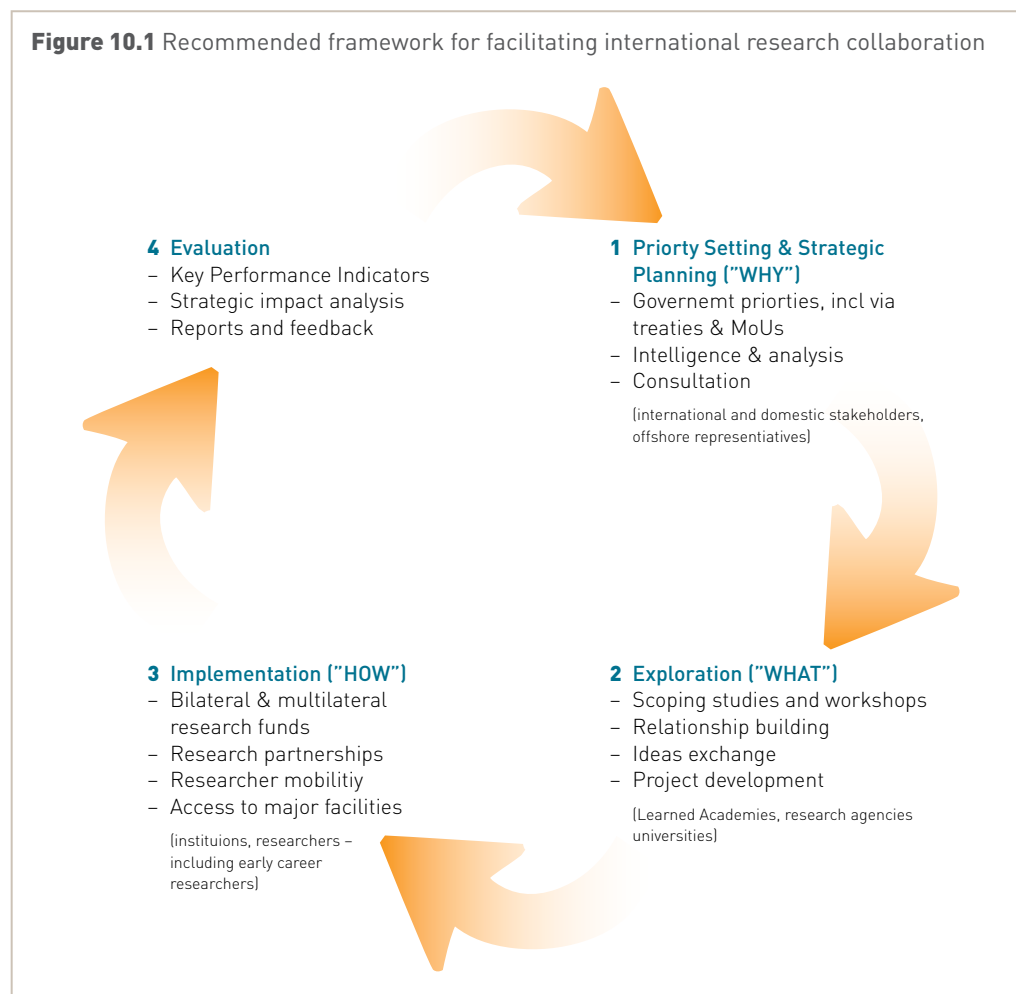
10 CONCLUSION

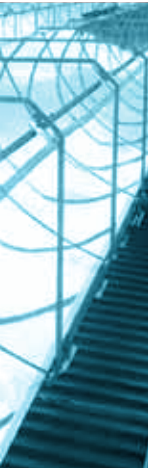
An effective international research collaboration program should seek to build enduring research relationships. Where lasting relationships can be established, the outcomes from the funded projects are much greater than the immediate outputs from the meetings held and research conducted. This 'snowballing' of outcomes has been evident from many of the projects and activities funded by the ISL program.

The national benefit generated by a collaboration program will be greatest when effort is concentrated primarily on priority partner countries and in fields of research that are of strategic importance to Australia.

Consultation is an important element in priority setting and strategic planning, serving to ensure that the program takes account of government priorities and effort, draws on existing networks and processes, such as those of the Learned Academies and national research institutions, and utilises intelligence and local expertise, such as that provided by Science Counsellors and other Government representatives based overseas.

Figure 10.1 depicts a recommended framework for a future program of support for international research collaboration.





Such a program needs to emphasise strategic relationship building as a key objective, recognising that expenditure on ideas exchange activities, such as workshops and staff exchanges, is an important component of the program.

Strategic expenditure on bilateral and multilateral relationship building, including the strengthening of communication and understanding with partner countries, should be facilitated using Science Counsellors and other staff located in those countries.

The expertise and networks of the Learned Academies should also be used to deliver activities that align with, and support, the development of key research relationships.

A science engagement program needs to support the early, developing stages of research cooperation and, hence, funding for research collaboration should be available for both the development and conduct of joint research projects as necessary.

Future funding for research collaboration should be provided via bilateral and/or multilateral research funds as these ensure funding is available from partner countries, and avoid duplication with other programs such as those administered by the ARC. The future use of general Competitive Grants is not favoured as they do not achieve these outcomes.

A collaboration program should continue to provide funding that enables Australian researchers to access research facilities that are not available in this country.

In summary, the future policy framework for the program should encompass:

- the building of strategic research relationships via strategic investment and using the expertise of DIISR, Science Counsellors and the Learned Academies;
- the strengthening of those relationships using bilateral and/or multilateral research funds that support the development and/or conduct of research, including follow-up funding as necessary; and
- assistance for Australian researchers to access major overseas research facilities.

Allen Consulting noted⁷² that the ISL is producing significant outputs and longer-term outcomes for a relatively modest expenditure. However, ISL funding has essentially remained static in real terms over the past decade while the ARC and the National Health and Medical Research Council (NHMRC) have received major funding increases and the Government has invested heavily in research infrastructure via the Super Science initiative.

Given the high level of excess demand for the ISL program and the substantial outcomes and impact of the projects and activities undertaken, ISL funding should be substantially increased from its current level to the order of \$20 million per annum.

Under the current structure of the competitive components, a doubling of funding would only see the success rates for applicants rise to a little over 30 per cent, hence it can be expected that the additional projects funded would be of high quality.

72 Allen Consulting (2010), Evaluation of the International Science Linkages Program

This conclusion is consistent with that of the House of Representatives Standing Committee on Industry, Science and Innovation⁷³ which recommended that the successor to the ISL program should have its budget increased and indexed.

The Australia-India Strategic Research Fund provides \$10 million per year for collaboration with Indian researchers. At present the ISL program has only \$12 million per year for collaboration with Australia's other priority partners, China, Europe, Japan and the United States plus limited engagement with the rest of the world.

Given China's primary importance to Australia's trade and economic growth, and its rapidly expanding research capability, collaboration with China should form a major element of Australia's future research collaboration effort. The high level support from China for enhanced research engagement with Australia underlines the strong potential dividends from additional support.

As the Standing Committee concluded⁷⁴, the existing funding for scientific collaboration with China of \$2 million per year is clearly insufficient for a country that is of such importance to Australia's future.

A larger and longer term Australia-China research fund should therefore be given high priority in the new funding.

The nature of collaborative research projects requires that funding be provided to projects for periods up to three years. For the program to be workable, and to function beyond a single funding round, it therefore needs to be funded for a period of five years. A five year funding period would also provide scope to support the 'follow-on' stages of a project, thereby helping to capture the full benefits of the collaborative relationship.

ISL funding should be provided for a further five-year period with an evaluation at the end of three years.

73 House of Representatives Standing Committee on Industry, Science and Innovation (2010), Australia's International Research Collaboration

74 House of Representatives Standing Committee on Industry, Science and Innovation (2010), Australia's International Research Collaboration





APPENDIX A

ISL EVALUATION TERMS OF REFERENCE

TERMS OF REFERENCE

In assessing government activity, evidence must be used to demonstrate whether the activity is the best way to achieve the government's policy objectives and desired outcomes.

1. Appropriateness

Provide an overview of the appropriateness of the ISL program, and the resulting resource allocation, by addressing the following questions:

- Is there a demonstrated need for the ISL program?
- Is the activity being undertaken by the most appropriate level of government?
- Is the ISL program the best way to address the policy objectives?

2. Effectiveness

Provide an overview of the effectiveness of the ISL program by addressing the following questions:

- Does the program have clear and consistent objectives?
- Is the ISL program effective in achieving the objectives?
- What has been the impact of the program on individual participants and the research sector as a whole?

3. Efficiency

Provide an assessment of the efficiency of the ISL program by addressing the following matters:

- Is the program administered and delivered in an efficient manner?
- Does the program represent good value for money?
- What compliance costs are incurred by stakeholders?

4. Integration

Address the extent to which the ISL program achieves integration by examining the following questions:

- Are the ISL program objectives consistent with other related Australian Government activities?
- Are the ISL program objectives consistent with related foreign government activities?
- Are ISL program activities appropriately coordinated with related Australian Government and foreign government activities?





5. Performance Assessment

Provide an assessment of performance measurement for the ISL program by examining the following matters:

- Are the ISL program's key performance indicators appropriate, and do they relate clearly to the program objectives?
- Does the ISL program have sound data collection methodologies?
- Have recommendations from previous evaluations been implemented?
- Does the ISL program observe regular monitoring protocols?

6. Strategic Policy Alignment

Examine the extent to which the ISL program has been consistent with the government's strategic policy priorities.

APPROACH TO THE EVALUATION

The Evaluation Team has overall responsibility for the evaluation. The final evaluation report will be produced by the Evaluation Team as a product of original research and input from program stakeholders and an economic consultant.

The consultant will prepare a report that describes its findings. The Evaluation Team will draw from this report in the preparation of the Final Evaluation Report.

The Evaluation Team will ensure that all the terms of reference have been addressed and that methodologies are followed that provide evidence for any conclusions drawn in the final report.

The Evaluation Team will comprise:

- Senior Executive Service officer from DIISR (Chair);
- A member of a university that has a significant international presence;
- National Academies Forum nominee;
- CSIRO representative;
- ARC representative;
- Department of Foreign Affairs and Trade (DFAT) representative; and
- Ms Mary Finlay, General Manager, International Science and Education Investment Fund Branch (in an advisory capacity).

It is expected that the Evaluation Team will meet at the following points during the evaluation:

- Discuss the terms of reference, evaluation methodology and stakeholder consultation process;
- Consider findings from the consultant and discuss first draft of the evaluation report; and
- Approve final report.

METHODOLOGY OF EVALUATION

The Evaluation Team is responsible for the conduct of the evaluation, including final clearance of the report. The evaluation methodology will comprise:

- Review of relevant literature including the international context of similar programs, relevant reports and statistical data;
- Collection and analysis of data from within the department to support the assessment of program efficiency, effectiveness and performance assessment;
- Use of submissions provided by stakeholders to the House of Representatives Inquiry into International Research Collaboration;
- Use of an independent consultant to:
 - consult stakeholders and obtain their views on the conduct and outcomes from the program;
 - collect new data from stakeholders relating to efficiency and effectiveness;
 - provide an assessment of the economic and social impact of the ISL outcomes;
 - provide an evaluation of the program appropriateness, processes and governance;
- Benchmark the assessment against the 2003 evaluation of the program.

June 2010





APPENDIX B

MEMBERSHIP OF THE ISL EVALUATION TEAM

TEAM MEMBERS⁷⁵

Terry Lowndes (Chair)

Principal Adviser
Department of Innovation, Industry, Science and Research

Paul Harris

General Manager, Government and International Engagement
CSIRO

Dr Margaret Hartley

Chief Executive Officer
Australian Academy of Technological Sciences and Engineering

Dr Steve Winslade

Director, Australian Phenomics Facility
Australian National University

John Griffin

Assistant Secretary, EU and Western Europe Branch
Department of Foreign Affairs and Trade

Simon Sedgley

Director, Program Evaluation
Australian Research Council

Mary Finlay (in an advisory capacity)

General Manager, International Science and Education Investment Fund Branch
Department of Innovation, Industry, Science and Research

ECONOMIC CONSULTANT

Grahame Cook

Director
Allen Consulting Group

Barbara Winkel

Analyst
Allen Consulting Group

⁷⁵ Role descriptions refer to those held at the commencement of the evaluation in July 2010.





APPENDIX C

DESCRIPTION OF ISL PROGRAM COMPONENTS

The description of ISL components shown below is drawn from the 2010 ISL program guidelines⁷⁶ and earlier versions.

COMPETITIVE GRANTS

The Competitive Grants element of the ISL program provides support, on a competitive basis, for Australian researchers to participate in strategically focussed, leading edge, international scientific research and technology collaborations which meet the objectives of the ISL program. Eligible expenses include travel costs, salaries for non-ongoing employees, project bench fees/consumables and workshops that support a specific international collaborative research project

Applications for Competitive Grants have also been accepted for major international scientific conferences held in Australia.

AUSTRALIA-CHINA SPECIAL FUND FOR SCIENTIFIC AND TECHNOLOGICAL COOPERATION

The Australian Government in conjunction with the Government of the People's Republic of China has established the Australia-China Special Fund for Scientific and Technological Cooperation (Australia-China Special Fund). The Australia-China Special Fund is jointly managed by DIISR and its counterpart, the Chinese Ministry of Science and Technology (MOST). Australian applicants must apply to DIISR for funding, while the Chinese partner must apply to the Chinese Government.

The Australia-China Special Fund element of the ISL program provides support, on a competitive basis, for Australian researchers to participate in strategically focussed, leading edge, international scientific research and technology collaborations, in an agreed bilateral priority area of research with Chinese partners. The Australia-China Special Fund will support multilateral projects provided the primary project partner is Chinese and they have submitted an application to the Chinese Government. Eligible expenses are similar to those for Competitive Grants.

FRENCH-AUSTRALIAN SCIENCE AND TECHNOLOGY PROGRAM

The Australian Government and the Government of the Republic of France established the French-Australian Science and Technology (FAST) program. The FAST program is jointly managed by DIISR and its counterpart French Ministries of Higher Education and Research, and Foreign Affairs and European Affairs (via the French Embassy in Canberra, Australia). The lead organisation from each country must submit an application to their respective Government.

⁷⁶ Department of Innovation, Industry, Science and Research (2010), International Science Linkages Guidelines





The FAST program provides support, on a competitive basis, to promote and facilitate scientific and technological cooperation in priority fields of research between Australian and French researchers. Grants are available to eligible Australian applicants from both the public and private sectors, for new collaborative research projects which draw on complementary strengths in both countries and which meet the objectives of the ISL program. Australian grant funds must be applied to travel and living costs for Australian researchers travelling to France.

AUSTRALIA-KOREA INDUSTRIAL TECHNOLOGY COOPERATION FUND

A small number of competitive grants were awarded between 2001 and 2003 to support collaboration between Australian and Korean researchers.

STRATEGIC POLICY

The Strategic Policy component of the ISL program provides a vehicle for the Australian Government to establish, reinforce and leverage strategic links and relationships with overseas counterparts. Strategic Policy enables the Australian Government to facilitate and support international scientific cooperation in priority areas of science with key countries.

Strategic Policy includes support for:

- bilateral activities with key countries, including workshops, symposia and research exchange programs;
- Australian participation in multilateral activities, such as under the auspices of the Organisation for Economic Co-operation and Development (OECD) and Asia-Pacific Economic Cooperation (APEC); and
- other strategic activities that meet the objectives of the ISL program.

DIISR may consult with the Australian research community, industry and government to identify activities that will be likely to best contribute to the objectives of the ISL program. Strategic Policy is not an open application scheme and there is no formal call for proposals. Eligible expenses include travel costs, salaries for non-ongoing employees, project bench fees/ consumables and conference/workshop costs.

AUSTRALIA-EUROPE RESEARCH COLLABORATION FUND

The Australia-Europe Research Collaboration Fund (Europe Fund) provides a vehicle for the Australian Government to establish, reinforce and leverage strategic research links and relationships with the European Union and individual European countries.

The Europe Fund enables the Australian Government to support:

- engagement by Australian researchers with the European Union Framework Programmes;
- bilateral activities with European countries;
- Australian participation in European research organisations; and
- other strategic activities involving the European Union and European countries that meet the objectives of the ISL program.

DIISR may consult with the Australian research community, industry and government to identify activities that will be likely to best contribute to the objectives of the ISL program and which arise out of discussions with bilateral or multilateral partners. The Europe Fund is not an open application scheme and there is no formal call for proposals. Eligible expenses include travel costs, salaries for non-ongoing employees, project bench fees/consumables and conference/workshop costs.

SCIENCE AND TECHNOLOGY SHOWCASING

Until 2005-06, funds were applied to the strategic showcasing of Australia's international science, engineering, technology and innovation capabilities at major international events such as the EU's Information Technology for Society's annual symposium and technical exhibition and the Hannover Messe manufacturing technologies showcase.

As this component supported a diverse range of activities, there were no specific proposal forms or deadlines for submission of proposals.

ISL – SCIENCE ACADEMIES PROGRAM

The ISL – Science Academies Program complements the competitive funding and Strategic Policy components of ISL by providing support for activities using the networks and expertise of the Australian Academy of Science (AAS) and the Australian Academy of Technological Sciences and Engineering (ATSE). The grant funds are administered by the relevant Academies. The ISL – Science Academies Program comprises three elements:

- international exchanges and fellowships;
- frontiers of science and technology missions and workshops; and
- the Sir Mark Oliphant International Frontiers of Science and Technology conferences.

ISL – HUMANITIES AND SOCIAL SCIENCES ACADEMIES PROGRAM

The ISL – Humanities, Arts and Social Sciences (HASS) Academies Program provides support for activities using the networks and expertise of The Australian Academy of the Humanities (AAH) and the Academy of the Social Sciences in Australia (ASSA). The grant funds are administered by the relevant Academies. The ISL – HASS Academies Program primarily supports:

- international research fellowships and projects;
- fellowships for eminent scholars to visit Australia; and
- international collaborative workshops.





ACCESS TO FACILITIES

The Australian Nuclear Science and Technology Organisation (ANSTO) manages the Access to Major Research Facilities Program for DIISR. The objectives of the Program are to provide support for Australian researchers from industry, private or public research organisations and universities to travel to:

- access major international research facilities not available in Australia; and
- attend strategic planning meetings where this can be clearly demonstrated to be essential to Australia's participation in projects using major international research facilities not available in Australia.

The major research facilities covered in this Program are those in excess of \$100 million capital investment that are not available in Australia. These facilities include: synchrotron radiation sources, high flux neutron beam sources, high energy physics facilities and astronomical facilities. Funding for access to high energy accelerators at the European Organization for Nuclear Research (CERN) and High Energy Accelerator Research Organization (KEK) was previously administered by the University of Sydney.

APPENDIX D

ISL PROGRAM EXPENDITURE

Table D.1 ISL expenditure by mode of delivery 2002–03 to 2010–11

| COMPONENT TYPE | Expected | | | | | | | | | | TOTAL |
|--|--------------------|--------------------|--------------------|---------------------|---------------------|---------------------|---------------------|----------------------------------|---------------------|---------------------|-------|
| | 2002–03 | 2003–04 | 2004–05 | 2005–06 | 2006–07 | 2007–08 | 2008–09 | 2009–10 | 2010–11 | | |
| Competitive Allocations | | | | | | | | | | | |
| Competitive Grants | \$3,924,375 | \$4,119,663 | \$5,131,935 | \$6,527,255 | \$5,648,075 | \$4,397,826 | \$6,016,283 | \$4,132,553 | \$2,723,516 | \$42,621,481 | |
| Australia-China Special Fund | \$223,220 | \$221,318 | \$359,881 | \$408,267 | \$1,469,653 | \$2,143,530 | \$2,032,607 | \$2,149,286 | \$1,848,399 | \$10,856,161 | |
| French-Australian S&T Program | \$0 | \$0 | \$133,229 | \$290,124 | \$420,117 | \$245,645 | \$210,524 | \$202,921 | \$391,610 | \$1,894,169 | |
| Korea Fund | \$136,797 | \$161,000 | \$79,500 | \$0 | \$0 | \$7,360 | \$0 | \$0 | \$0 | \$384,657 | |
| | \$4,284,392 | \$4,501,981 | \$5,704,545 | \$7,225,646 | \$7,537,845 | \$6,794,361 | \$8,259,414 | \$6,484,760 | \$4,963,525 | \$55,756,468 | |
| Strategic Investment | | | | | | | | | | | |
| Bilateral (incl. Europe Fund) & Multilateral | \$1,176,289 | \$714,127 | \$760,472 | \$533,753 | \$1,175,307 | \$1,559,931 | \$1,429,494 | \$2,021,629 | \$4,442,175 | \$13,813,177 | |
| Showcasing | \$728,729 | \$806,442 | \$869,237 | \$687,361 | \$7,000 | \$0 | \$0 | \$0 | \$0 | \$3,098,770 | |
| | \$1,905,018 | \$1,520,569 | \$1,629,709 | \$1,221,114 | \$1,182,307 | \$1,559,931 | \$1,429,494 | \$2,021,629 | \$4,442,175 | \$16,911,947 | |
| Sub-Contracted Components | | | | | | | | | | | |
| ISL – Science Academies Program (AAS & ATSE) | \$842,750 | \$1,250,000 | \$1,467,750 | \$1,032,250 | \$1,500,000 | \$2,250,000 | \$750,000 | \$1,232,700 | \$1,767,300 | \$12,092,750 | |
| ISL – HASS Academies Program (AAH & ASSA) | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$130,000 | \$200,000 | \$750,000 | \$1,080,000 | |
| Access to Overseas Research Facilities (ANSTO & Uni Syd) | \$865,000 | \$765,000 | \$965,000 | \$765,000 | \$840,000 | \$840,000 | \$1,109,091 | \$130,909 | \$400,000 | \$6,680,000 | |
| | \$1,707,750 | \$2,015,000 | \$2,432,750 | \$1,797,250 | \$2,340,000 | \$3,090,000 | \$1,989,091 | \$1,563,609 | \$2,917,300 | \$19,852,750 | |
| Total Expended by Financial Year: | \$7,897,159 | \$8,037,550 | \$9,767,004 | \$10,244,011 | \$11,060,152 | \$11,444,292 | \$11,677,999 | \$10,069,998⁷⁷ | \$12,323,000 | \$92,521,165 | |

⁷⁷ The 2009–10 budget contained a savings measure which reduced ISL funding in that year by \$2 million.





Figure D.1 ISL expenditure by mode of delivery 2002-03 to 2010-11

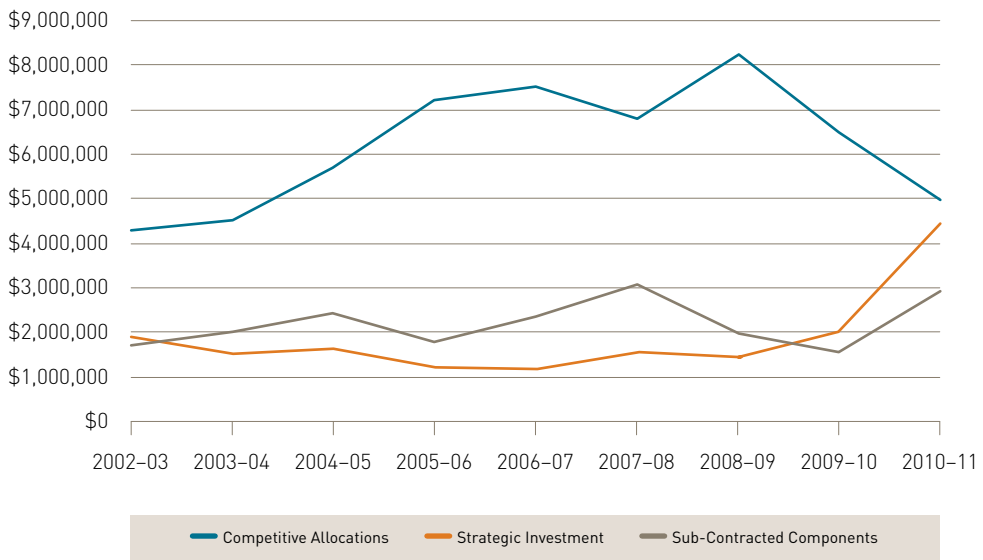


Table D.2 Total ISL expenditure by type of activity 2002–03 to 2010–11

| COMPONENT | RESEARCH COLLABORATION | IDEAS EXCHANGE & RELATIONSHIP BUILDING | ACCESS TO FACILITIES |
|---------------------------------|------------------------|--|----------------------|
| Competitive Allocation | | | |
| Competitive Grants | \$41,144,978 | \$1,476,503 | |
| Australia-China Special Fund | \$10,856,161 | | |
| French-Australian S&T Program | \$1,894,169 | | |
| Korea Fund | \$384,657 | | |
| Strategic Investment | | | |
| Bilateral inc Europe Fund | \$793,500 | \$12,003,399 | |
| Multilateral | | \$1,016,278 | |
| Showcasing | | \$3,098,770 | |
| Subcontracted Activities | | | |
| Access to facilities | | | \$6,680,000 |
| ISL – Science Academies Program | | \$12,092,750 | |
| ISL – HASS Academies Program | | \$1,080,000 | |
| | \$55,073,465 | \$30,767,700 | \$6,680,000 |



APPENDIX E

SCIENCE COLLABORATION POLICIES AND PROGRAMS IN OTHER COUNTRIES

CHINA

China recognises the key role played by science and technology in supporting growth and in meeting the country's socio-economic and environmental challenges. The government is also promoting international science and technology collaboration as a method of capacity building and as a way of establishing close ties with distinguished foreign universities, research institutions and companies.

Stated government objectives include:

- enhancing China's participation in multilateral and bilateral science and technology cooperation programs;
- increasing China's international science and technology reputation;
- promoting national research and development activities in key areas;
- creating international science and technology development zones and parks;
- attracting international human capital to China; and
- providing opportunities for China's top scientists and researchers to demonstrate their abilities internationally.

China has already taken important measures to build international science and technology relationships. At present all key national science agencies include a branch responsible for international cooperation. China has science and technology agreements with 150 countries or regions; joint science and technology collaboration funds with Australia, the United Kingdom, the Netherlands, Switzerland, Canada, South Korea and Israel; and joint science parks and incubators in the United States, the United Kingdom, Russia, Singapore and the Netherlands.

The National Natural Science Foundation of China seeks to create a favourable environment regarding cooperative channels, funding and operational mechanisms to facilitate the participation of Chinese scientists in international cooperation and exchange. It is notable that collaboration with Chinese research institutions and scientists remains tightly controlled, and that only through government to government agreements is it possible for Australian scientists to engage with their Chinese counterparts.

JAPAN

Two of Japan's ministries, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Economy, Trade and Industry, account for 80 per cent of the Japanese Government's science and technology budget.

The Japan Society for the Promotion of Science is an agency within MEXT. Its main functions are to award grants under the *Grants-in-Aid for Scientific Research* and the *21st Century Centre of Excellence* (universities) program and promote international scientific cooperation.

Also a MEXT agency, the Japan Science and Technology Agency (JST) aims to build the program base of science and technology, promote leading-edge research and development, and increase the public understanding of science and technology. The *Strategic International Cooperation Program* is a significant initiative run out of this agency and involves cooperation with counterpart countries in Europe, America, Asia, and Africa.





The program consists mainly of the following:

1. **Research fund for international research projects (selected through open call for proposals)**

In principle, financial support of about 5 million to 10 million Japanese Yen is granted on the Japanese side per project per year for three years. This research fund can be used for expenses relating to (a) research meetings by project researchers; (b) joint research activities; (c) dispatch and invitation of researchers; etc.

2. **Workshops to promote international research collaboration (sponsored by JST)**

These workshops consist mainly of lectures by researchers from Japan and counterpart countries. The principal objective is to facilitate exchange activities among participating researchers.

3. **Other**

Financial support is provided as necessary for holding training courses, etc.

The program is implemented by organically combining the above-mentioned assistance according to the needs of counterpart countries and cooperative fields. The basis of the program is that JST assists researchers on the Japanese side and funding agencies in counterpart countries to assist researchers in their countries.

UNITED STATES OF AMERICA

The United States is a strong scientific performer, making the largest contribution to the world's research output. The United States recognises the importance of collaborative research and development, and the role that it plays in its economic development and leadership.

International activities are an integral part of the National Science Foundation's (NSF) mission, guided by NSF's strategic goals of Discovery, Learning, and Research Infrastructure – namely investing in a diverse, internationally competitive and globally engaged workforce of scientists, engineers and well-prepared citizens; investments in discovery across the frontier of science and engineering, connected to learning, innovation, and service to society; and broadly accessible, state-of-the-art and shared research and education tools.

NSF's international activities are extensive and encompass both the financial resources provided to the science and engineering community and the efforts of NSF management and staff who exercise leadership in international settings, fostering institutional frameworks that facilitate international cooperation in research and education. They support research programs distributed across the Foundation's directorates, the training of graduate students and postdoctoral fellows and, to a lesser extent, undergraduate and pre-college education programs.

NSF International activities fall into five general categories:

- United States Participation in Global-scale Projects and Research Networks includes more than two dozen international-scale projects in which NSF plays a lead role as well as many others in which NSF participates;
- Support for International Facilities includes both Foundation-supported facilities overseas, such as the Gemini-South Astronomical facility in Chile, and those on United States soil that represent international partnerships, such as Gemini-North in Hawaii;

- Linkages to Research Programs of Other Countries includes intergovernmental agreements of science and technology cooperation and joint programs designed to facilitate involvement of NSF-supported United States scientists and engineers in international collaboration;
- Support for New Scientists and Engineers involves many programs that provide United States scientists and engineers with opportunities to gain international professional experience, including approaches for post doctorate and early career researchers, graduate students, and undergraduate students; and
- International Science and Engineering Information includes tracking developments in research and education in other countries via participation in international meetings, surveys and assessments, and NSF offices in Tokyo and Europe.

Under the Obama administration the United States has increased support for science and innovation, including a doubling of funding for basic research over a period of 10 years and significant investment in science and technology as part of the American Recovery and Reinvestment Plan stimulus package.

Relevant science and technology components of the package included: US\$17 billion for science facilities, research and instrumentation in areas ranging from renewable energy to space to biomedical research; US\$30 billion for research and development activities in renewable energy production; US\$16 billion for postgraduate and undergraduate student support; US\$1.12 billion for creating loans, support and opportunities for small business; and US\$7.2 billion for wireless and broadband grants.

EUROPEAN UNION (EU)

The EU is a major funder of research through its ongoing Framework Programme. The current 7th Framework Programme (FP7) provides more than 50 billion euros over 2007–13 to support research.

The EU is currently working intensely to sharpen the coherence and effectiveness of its research and innovation policy by developing a single European innovation ‘market’, an ‘Innovation Union’.

In June 2010, driven by an urgent need to reverse the severe economic damage to Europe from the global financial crisis, the EU agreed to develop a major new strategy for European growth and jobs, *Europe 2020: a strategy for smart, sustainable and inclusive growth*. Creating the ‘Innovation Union’ is one of the principal objectives of the 2020 Strategy.

The goals of the Innovation Union are to:

- complete the European Research Area, within which research, researchers and knowledge can move freely;
- reduce the fragmentation of national research efforts and avoid duplication;
- pool national resources to finance large-scale research infrastructures;
- improve framework conditions for businesses to innovate – for example, by creating a single EU Patent;
- launch ‘European Innovation Partnerships’ to speed up the development and deployment of technologies;





- strengthen links between education, business and research; and
- foster entrepreneurship.

The EU Framework Programmes are predominantly designed to support research cooperation between EU member states and cooperation with specified international partner countries, particularly developing and emerging economies.

The 7th Framework Programme (FP7) is open to international research collaboration with developed non-EU states such as Australia – but almost always on a reciprocal-benefit basis, with non-EU member participants funding their own involvement.

The FP7 Work Program is structured in five blocks: Cooperation, Ideas, People, Capacities, and Nuclear Research. Around 60 per cent of the funding is devoted to the Cooperation Program, which supports translational consortia of industry and academia in ten thematic areas. Extremely comprehensive thematic research work plans (or ‘calls’) each year provide a very comprehensive sense of EU research priorities and a clear indication of where Australian research bodies and groups may seek to pursue research collaboration.

In the coming years, the massive scale and the variety of the EU’s framework programme research work plans, and the growing coherence of the ‘Innovation Union’ will offer great opportunities for EU-Australia research collaboration. The ongoing challenge will be to invest the time and resources to successfully navigate the complex, Member-State focussed EU administrative arrangements.

FRANCE

France is one of the world’s biggest economies. It is a major conductor of research and development. In 2008, French gross domestic expenditure on research and development was the 6th highest in the world, more than the United Kingdom, and almost five times Australia’s.

France has a large and internationally connected research community. In 2004, France produced 43,600 scientific publications, 4.7 percent of the world’s output, of which 42 per cent involved joint overseas authors.

France and Australia share complementary research strengths, particularly in mathematics, space sciences, geosciences, and the life sciences, especially health, biology and biochemistry. In 2008, there were 1,229 joint papers published between Australian and French researchers.

France’s international research and innovation collaboration objectives are to:

- reinforce the excellence of French science and technology;
- strengthen France’s innovation capacity;
- attract world-class researchers to France;
- contribute to international research efforts to address global challenges; and
- contribute to France’s international aid objectives.

The French Government supports strategic international research cooperation and relationships, including, for example, by contributing to the French-Australian Science and Technology Program, set up between the governments of Australia and France in November 2003.

In addition to initiatives through formal governmental links, France is engaged in very widespread international collaboration which is organised, funded, and executed at the level of individual research institutes and laboratories. Research collaboration opportunities with these bodies need to be identified, brokered and secured at the institute level.

The French Research Agency (ANR) has expressed its desire to develop more ambitious programs of cooperation between Australia and France. ANR is already involved in several international, annually conducted, joint scientific projects with countries such as the United States, Canada, Japan, China, Korea, Taiwan, Singapore and others. The objective of these programs is to promote researchers and young researcher's cooperation and mobility, scientific exchanges as well as to facilitate the effective access to major resources, tools and equipment.

GERMANY

Germany's Cabinet adopted the "Strategy for Internationalisation of Science and Research" in 2008, to boost collaborative research with developing countries and open up new fields of innovative potential. It continues to take on greater international responsibility and focuses on addressing global challenges.

The Strategy includes exchange of scientific staff, international collaborative research programs, and an internationally coordinated research agenda, enhancing Germany's presence in science and research and promoting its role as a major centre of education, research and innovation.

The Strategy aims at highlighting Germany's research landscape in selected topic areas of the High-Tech Strategy and provides a special focus on selected countries, making a decisive contribution by the Federal Ministry of Education and Research to promoting German innovation around the world.

Through the German Academic Exchange Service or DAAD (Deutscher Akademischer Austauschdienst), Germany supports international cooperation and collaboration between German academics and their international counterparts. The DAAD is a self-governing national agency of the institutions of higher education in Germany, representing 365 German higher education institutions with funding from national, provincial and private funding sources.

Collaborative Research Centres are funded by the Deutsche Forschungsgemeinschaft (German Research Foundation). Collaborative Research Centres are long-term, but temporary, university research centres in which outstanding PhD students, scientists and researchers (including international collaborators) work together within cross-disciplinary research programs.

The German Academies of Sciences and Humanities also offer research opportunities. Their central task is to coordinate and support long-term basic research projects and to develop and cultivate interdisciplinary dialogue, including on an international basis.





APPENDIX F

NATURE OF AUSTRALIAN ENGAGEMENT IN INTERNATIONAL RESEARCH COLLABORATION

Many Australian organisations have an involvement with international research collaboration. This Appendix provides an outline of the key types of organisations and the nature of their international activities.

AUSTRALIAN GOVERNMENT

INNOVATION, INDUSTRY, SCIENCE AND RESEARCH PORTFOLIO

Australian Research Council (ARC)

The ARC seeks to deliver policy and programs that advance Australian research and innovation globally and benefit the community. It supports high quality research through two types of grants – Discovery, under which funding is made available for investigator-initiated research and research fellowships, and Linkage, under which research projects, infrastructure, fellowships and centres are funded jointly with partner organisations in the private sector, government or the community. Funding is allocated on the basis of a competitive peer review process.

The ARC focuses on science engagement through a variety of approaches, including:

- National Competitive Grants – providing grants to researchers, including those who are undertaking their research overseas;
- Excellence in Research in Australia Initiative – aiming to encourage investment and attract international researchers to undertake research within Australia;
- collaborative publications – supporting co-authoring, including with international scientists;
- Mobility of Researchers – investing in development, attraction and retention of excellent researchers through fellowship grants;
- encouraging overseas investment – through the linkage projects scheme; and
- access to international research facilities – gaining access to infrastructure and research scales that would otherwise be unavailable.

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

CSIRO has been heavily engaged in international science collaboration since its creation. It engages with international partners in a number of ways, including:

- research collaboration – where staff engage in research projects with their overseas counterparts;
- bilateral and multilateral co-investment – sharing costs, risks and benefits by pooling resources;
- knowledge and technology exchange – where CSIRO and partner organisations transfer technical knowledge and data between one another for mutual benefit;
- contract research – where CSIRO researchers are contracted to provide research solutions for international clients;
- research for development – providing research solutions in developing nations;
- strategic relationships – long term partnerships with international organisations to make rapid advances due to investment scale; and
- research training – training scientists and researchers.





CSIRO suggests the benefits of international science engagement include advancing Australia's research capacity, attracting top quality researchers to Australia, undertaking projects that would otherwise be outside of Australia's ability due to scale and infrastructure and attracting investment as well as gaining access to new technologies and enhancing Australia's national standing.

CSIRO measures its successes in international science engagement through publications co-authored with international partners, relationship agreements and ongoing collaborative activities.

Australian Nuclear Science and Technology Organisation (ANSTO)

ANSTO supports international science and technology engagement to ensure that effective knowledge sharing and competitive research on issues relating to nuclear technology can occur and that Australia can benefit from them.

ANSTO undertakes multilateral collaborations under bodies such as the International Atomic Energy Agency and the Organisation for Economic Co-operation and Development (OECD) Nuclear Energy Agency. These collaborations provide frameworks where contacts, research and technology exchange can occur in circumstances where they might otherwise be constrained due to the nature of the technology. ANSTO also undertakes bilateral collaborations through inter-governmental arrangements, as well as gaining and providing access to research facilities.

Australian Institute of Marine Science (AIMS)

International collaboration is a foundation principle of AIMS. AIMS supports science engagement through ongoing formal and informal collaborations between its scientists and their counterparts internationally. It does this in order to expand research and science expertise, to address national science priorities, to participate in the development of new science and technology and to gain access to projects and infrastructure.

FOREIGN AFFAIRS AND TRADE PORTFOLIO

AusAid

AusAid provides funding for international research that has the end goal of reducing poverty and achieving sustainable development. AusAid engages with international partners on the basis that quality research is generated and that research has tangible impacts on developing nations. AusAid funding focuses on the areas of health, food security, governance and economics. In part, this research is funded through competitive grants that are open to research organisations within and external to Australia.

AusAid focuses on international collaboration as a method of increasing access and leverage with key stakeholders in the target countries. It sees development of a vibrant research community as a method of achieving its larger instrumental goals. AusAid also partners with international institutions active in development research, including Harvard, Yale, Oxford and the Overseas Development Institute.

Australian Council for International Agricultural Research (ACIAR)

ACIAR is an arm of the Australian Government's Official Development Assistance Program. It commissions research that leads to more productive and sustainable agriculture through collaborative projects involving Australia and developing country partners.

These research projects are developed within a framework reflecting the priorities of Australia's aid program and national research strengths, together with the agricultural research and development priorities of partner countries. ACIAR's mandate directs activities to developing countries in five regions: Papua New Guinea and the Pacific Islands, Southeast Asia, North Asia, South Asia and Southern Africa. Research is also allocated across regions through funding to the international agricultural research centres.

RESOURCES, ENERGY AND TOURISM PORTFOLIO

Geoscience Australia (GA)

GA engages with a number of international scientific organisations and agencies, commonly under international agreements, to deliver its program.

GA contributes geophysical and geodetic data for the Australian region (including Antarctica) to a number of overseas centres. Seismological data are provided in real time to World Data Centres, Incorporated Research Institutions for Seismology in the United States, several tsunami warning centres, earthquake watch centres in a number of other countries, and to the Comprehensive Nuclear-Test-Ban Treaty Organisation.

GA collaborates on carbon capture and storage research with Chinese government agencies, the Chinese Academy of Sciences and the University of Petroleum on the China-Australia Geological Storage project under an Asia Pacific Partnership on Clean Development and Climate (APP) funded programme (see below).

GA is also involved in intergovernmental research on geothermal energy through the International Partnership for Geothermal Technology (with the United States, Iceland and Switzerland) and with India's National Geophysical Research Institute.

CLIMATE CHANGE AND ENERGY EFFICIENCY PORTFOLIO

The Department of Climate Change and Energy Efficiency has several active international research collaborations, including the following.

Through the *Asia Pacific Partnership on Clean Development and Climate (APP, with Resources Energy and Tourism)*, a substantial amount of collaborative research work is underway through joint projects aimed at accelerating the development and deployment of clean energy technologies. APP partners Australia, Canada, China, India, Japan, Korea, and the United States have agreed to work together and with private sector partners to meet goals for energy security, national air pollution reduction, and climate change in ways that promote sustainable economic growth and poverty reduction. In January 2006, the Australian Government committed \$100 million over five years for the partnership.





Under the *Australian Climate Change Science Program*, funds have been provided to facilitate Australian involvement in the International Geosphere-Biosphere Programme, the World Climate Research Programme and the Scientific Committee on Oceanic Research; and to Support the work on terrestrial carbon cycle science through the Earth System Science Committee and the Subcommittee.

HEALTH AND AGEING PORTFOLIO

National Health and Medical Research Council (NHMRC)

The NHMRC has a range of schemes that support international research collaboration, including the NHMRC-European Union Collaborative Health Research Grants Scheme, which supports Australian participation in international research projects. The scheme enables Australian researchers to strengthen their individual efforts and collaborate with European and other international pioneering health and medical researchers.

Under the scheme, the NHMRC allocates \$4 million per calendar year to assist Australian participation in multinational research projects selected for funding by the EU under its Seventh Framework Programme (FP7) Cooperation themes.

Applications under FP7 are peer reviewed by the European Commission (EC). The NHMRC conducts a review of the Australian component of an application which has been favourably evaluated by the EC for funding.

Issues to be considered when assessing eligible projects for NHMRC funding under the scheme include the aims and/or objectives of the proposed research; the relevance of the research to health or health related outcomes; the value of the Australian contribution to the EU research; and the value to Australian research from Australian participation.

STATE AND TERRITORY GOVERNMENTS

State and territory governments support international research collaboration using a number of approaches. Some examples are provided below.

The *Queensland Government* supports international engagement by researchers in two principal ways; through strategic alliances with international government and research institutions and through competitive grant programs that target specific countries and research fields. Among the strategic alliances that have been formed are agreements with bodies such as the Ministry of Science and Technology (India), The Smithsonian Institute (United States) and the Ministry of Science and Technology (China).

The stated rationale for Queensland's support of international research collaboration includes:

- gaining access to critical research infrastructure and networks;
- building critical mass, research expertise and capacity; and
- gaining opportunities to address global challenges.

The *South Australian Government* supports international research collaboration through agreements with other regional governments, such as with the Province of Manitoba in Canada. These agreements allow local researchers to pool resources with their overseas counterparts to enable participation in larger and more complex research projects. The Government supports international engagement for a variety of reasons including:

- early access to new technologies;
- opportunities to develop intellectual property that would otherwise be lost;
- promotion of Australia as a 'science destination'; and
- improved ability to attract high skilled scientists to fill Australian vacancies.

LEARNED ACADEMIES

The Learned Academies manage a range of collaborative research activities funded under the ISL. The Academies have international collaborative relationships outside the ISL but these are limited due to funding restrictions. Some other international collaborative activities of the academies are noted below.

Australian Academy of Science (AAS)

International engagement has been one of the AAS's main objectives since its foundation in 1954. The Academy works in partnership with a number of national and international scientific organisations around the world on a wide range of scientific and science policy issues. Through bilateral and multilateral engagement, using its long standing networks with sister academies and counterpart international organisations, the Academy aims to ensure that Australian science and technology plays an important role in addressing the grand challenges of the 21st century.

The Academy recognises science as a universal activity and has been an international network from the start, electing Fellows and Foreign Members from across the world and encouraging international collaboration between researchers. The Academy's international grants program enables high-calibre Australian researchers to initiate collaborations, exchange ideas, and develop new skills and experience from the world's leading researchers.

Australian Academy of Technological Sciences and Engineering (ATSE)

ATSE has strong collaborative and strategic linkages internationally through bodies such as the Council of Academies of Engineering and Technological Sciences (CAETS), and formal bilateral arrangements with sister academies worldwide. Within CAETS, ATSE promotes active collaboration with other international bodies such as the International Council for Science.

ATSE's access to 800 of the brightest and best applied scientists, technologists and engineers in Australia across academia, industry and government provides significant leverage to enable ATSE to draw on the expertise and networks of its Fellows to ensure bilateral/multilateral activities involve appropriate participation with support at the highest level. The ATSE President, Vice Presidents and senior ATSE Executive participate regularly in high-level international think tanks, chair bilateral funding research granting bodies and actively contribute to multilateral science and technology meetings to identify and better influence policy advice and outcomes for Australia.





Australian Academy of the Humanities (AAH)

A key component of the AAH's mandate is to build and maintain relations and exchanges with allied international bodies, to broker relationships between Australian researchers and scholars of other nations and to engage with the humanities policy and advocacy community internationally.

The AAH is active in its global organisation, the Union Académique Internationale, and participates in other international humanities networks, including the Consortium of Humanities Centers and Institutes. The AAH is a key point of contact in Australia for international organisations that wish to explore collaborative activities with Australia's humanities researchers.

International research collaborations are supported by a small grants and exchange programme including:

- the Humanities Travelling Fellowships scheme which funds international travel for early-career researchers;
- the Bilateral International Exchange Programme with allied organisations in Sweden and Britain, which facilitate researcher exchange and collaboration; and
- Visiting Scholar programmes to assist scholars from Russia and the former Soviet Union, as well as Indonesia and South-East Asia, to attend conferences, deliver papers and gain access to research materials in Australia.

The AAH also has strong links with the Irish Research Council in the Humanities and Social Sciences, and works closely with the Embassy of France in Australia on a variety of activities. New agreements are also in train with the Italian Embassy and the Accademia Nazionale dei Lincei to provide further collaborative opportunities for humanities researchers from both countries.

Academy of the Social Sciences in Australia (ASSA)

ASSA's non-ISL funded bilateral programs are few and limited to very modest exchanges of one or two scholars per year. ASSA has wider impact however as it holds the Secretariat for The Association of Asian Social Science Research Councils, an organisation of the sixteen major Asian nations.

In April 2002, ASSA and the French Embassy in Canberra agreed to encourage and assist the formation of stronger research relationships between social scientists in the two countries. A funded program (the Social Sciences Collaborative Research Projects) was established to initiate and/or enhance joint research activity. Special consideration is given to projects of interest to both French and Australian scholars and to those relevant to Pacific Island studies where research into indigenous and non-indigenous contact is topical and important.

The exchange agreement enjoyed by the Chinese Academy of Social Sciences and the Academy of the Social Sciences in Australia celebrates its thirtieth year in 2010. This agreement has supported a regular program of visits by Chinese researchers to Australia and Australian researchers to China, and has allowed researchers from both countries the opportunity for access to research and research materials not easily accessible outside the countries concerned, as well as the opportunity to develop networks of scholars with related interests both within and between the two countries. Agreement has been reached by the two Academies to upgrade the existing exchange agreement to a program which bestows Joint-action Grants, in the manner of the ASSA's Australia-France program.

The Exchange Program between the Academy of the Social Sciences and the Koninklijke Nederlandse Akademie van Wetenschappen (Royal Netherlands Academy of Arts and Sciences) began in 1987, and facilitates visits by scholars to specific research institutes or conferences in the Netherlands, preferably for periods of one or two weeks, with a reciprocal agreement facilitating the visits by Dutch researchers in both the humanities and social sciences to Australia.

The Australia-Britain Special Joint Project Funding scheme is run by both the Academies of the Social Sciences and the Humanities in cooperation with the British Academy. Following the model of the Australia-France program, this scheme accepts proposals from collaborative teams of United Kingdom and Australian researchers in the social sciences and humanities for funding to offset the cost of travel and living expenses associated with a research project.

HIGHER EDUCATION

Many Australian higher education institutions undertake collaborative research with international partners. The Group of Eight (Go8) partners have an international presence and profile, and the Go8 has entered into several international research collaboration agreements, including:

- the Go8 Germany Joint Research Co-operation Scheme is a joint initiative of the Go8 and the German Academic Exchange Service (DAAD), Germany's national agency for the support of international academic co-operation;
- an MoU to deepen its co-operation with the leading research universities in China, known as the C9, a consortium of universities which has agreed to collaborate to enhance its international linkages and respond more effectively to global challenges;
- an MoU with the European Molecular Biology Laboratory (EMBL) for collaboration on the joint awarding of PhDs qualifications in molecular biology; and
- the Chile – Go8 Agreement on Human Capital Development supports the Chilean Government's efforts to ensure that students enrol in high quality research intensive institutions.

BUSINESS

Many Australian businesses and multinational businesses with an Australian presence have strong international research linkages. These linkages and the resultant research collaborations are frequently commercial-in-confidence, where businesses naturally seek to protect the intellectual property involved.





REFERENCES

- Allen Consulting (2003), A Study of International Science and Technology Policies and Programs
- Allen Consulting (2003), Evaluation of the Innovation Access Programme – International Science and Technology, Final Report
- Allen Consulting (2010), Evaluation of the International Science Linkages Program
- Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of International Collaboration Partners
- Allen Consulting (2010), Evaluation of the International Science Linkages Program, Survey of Recipients of Competitive Grants
- ALP (2010), Innovation Policy Statement
- ARC (2010), Annual Report 2009–10
- ATSE (2010), Impact of the ISL – Science Academies Program, A Five Year Self Assessment
- Australian Government (2009), Powering Ideas: An Innovation Agenda for the 21st Century
- Bercovitz J and Feldmann M (2010), The Mechanisms of Collaboration in Inventive Teams – Composition, Social Networks and Geography, *Research Policy* 2495
- CSIRO (2009), Report on CSIRO International Engagement 2008/09
- Deloitte (2008), Impacts of International Science Engagement, prepared for the Department of Innovation, Industry, Science and Research
- Department of Innovation, Industry, Science and Research (2010), International Science Linkages Guidelines
- Department of Innovation, Industry, Science and Research (2010), National Collaborative Research Infrastructure Strategy Evaluation Report
- Department of Innovation, Industry, Science and Research (2010), Survey of Australia-China Special Fund Stakeholders, unpublished
- FEAST (2009), A Bibliometric Analysis of Australia’s International Research Collaboration in Science and Technology: Analytical Methods and Initial Findings, FEAST Discussion Paper 1/09
- FEAST (2009), Opportunities for Australian-European Collaboration in Research and Innovation, Presentation to the October 2009 symposium on Advancing Europe-Australia Cooperation in Higher Education
- Federal Ministry of Education and Research, Germany (2008), Strengthening Germany’s role in the global knowledge society: Strategy of the Federal Government for the Internationalization of Science and Research
- Foursight Associates (2009), Review of the International Exchange Programs of the Australian Academy of Science
- House of Representatives Standing Committee on Economics (2010), Raising the Productivity Growth Rate in the Australian Economy



- House of Representatives Standing Committee on Industry, Science and Innovation (2010), Australia's International Research Collaboration
- Lutz-Peter Berg (2009), A Comparison of "Science Diplomacy" Networks, Swiss Embassy, London
- OECD (2008), The Global Competition for Talent: Mobility of the Highly Skilled
- OECD (2009), Measuring China's Innovation System: National Specificities and International Comparisons, STI Working Paper 2009/1
- OECD (2010), The OECD Innovation Strategy: Getting a Head Start on Tomorrow
- PMSEIC Working Group (2006), Australia's Science and Technology Priorities for Global Engagement
- Prime Minister Gillard and European Commission President Barosso, Joint media conference, Brussels, 4 October 2010
- Productivity Commission (2007), Public Support for Science and Innovation, Research Report 03/2007
- Senator the Hon Kim Carr (2008), Media Release: ARC Fellowships to Become More International, 26 March
- Steering Committee for a National Science Communications Strategy (2010), *Inspiring Australia: A national strategy for engaging with the sciences*
- Treasurer Swan (2010), Media release: Government's Productivity Agenda to Tackle Future Challenges

