SOUTH AUSTRALIAN INTERNATIONAL ENGAGEMENT THROUGH RESEARCH & DEVELOPMENT

Engaging With New Geopolitical Areas: A Global Challenge through R&D

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International R&D Collaboration
Investment, Trade and Immigration
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Finally, but most importantly, a special mention goes to my family and to Andrew Williams for their unconditional support throughout these months. I am extremely grateful for their presence in my life, without them I would have never got this far.
## List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
</tr>
<tr>
<td>ACC</td>
<td>Australia-China Council</td>
</tr>
<tr>
<td>AISRF</td>
<td>Australia-India Strategic Research Fund</td>
</tr>
<tr>
<td>AKF</td>
<td>Australia-Korea Foundation</td>
</tr>
<tr>
<td>ARC</td>
<td>Australian Research Council</td>
</tr>
<tr>
<td>BERD</td>
<td>Business Expenditure on R&amp;D</td>
</tr>
<tr>
<td>BMGF</td>
<td>The Bill and Melinda Gates Foundation</td>
</tr>
<tr>
<td>CACHSR</td>
<td>China-Australia Centre for Health Science Research</td>
</tr>
<tr>
<td>CAESIE</td>
<td>Connecting Australian European Science &amp; Innovation Excellence</td>
</tr>
<tr>
<td>CII</td>
<td>Confederation of Indian Industry</td>
</tr>
<tr>
<td>COST</td>
<td>European Cooperation in Science and Technology</td>
</tr>
<tr>
<td>CRC</td>
<td>Cooperative Research Centres</td>
</tr>
<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
</tr>
<tr>
<td>CSP</td>
<td>Comprehensive Strategic Partnership</td>
</tr>
<tr>
<td>DAAD</td>
<td>Deutscher Akademischer Austansch Diens</td>
</tr>
<tr>
<td>DIISR</td>
<td>Department of Innovation, Industry, Science and Research</td>
</tr>
<tr>
<td>DSD</td>
<td>Department of State Development (South Australia)</td>
</tr>
<tr>
<td>ERA</td>
<td>European Research Area</td>
</tr>
<tr>
<td>ERC</td>
<td>European Research Council</td>
</tr>
<tr>
<td>ERLEP</td>
<td>Emerging Research Leaders Exchange Program</td>
</tr>
<tr>
<td>ETRI</td>
<td>Electronics and Telecommunications Research Institute</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FAFB</td>
<td>Fisheries and Biotechnologies</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
</tr>
<tr>
<td>FEAST</td>
<td>the Forum for European-Australian Science and Technology Cooperation</td>
</tr>
<tr>
<td>FP</td>
<td>Framework Programme</td>
</tr>
<tr>
<td>FYP</td>
<td>Five-Year-Plan</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Production</td>
</tr>
<tr>
<td>GERD</td>
<td>Gross Domestic Expenditure on R&amp;D</td>
</tr>
<tr>
<td>GII</td>
<td>Global Innovation Index</td>
</tr>
</tbody>
</table>
Go8 Group of Eight Universities
GOVERD/PUBERD Public Expenditure on R&D
GROW Graduate Research Opportunities Worldwide
HERD Higher Education Expenditure on R&D
ICT Information and Communication Technology
JCM Joint Commission Steering Committee Meeting on Science and Technology
JV Joint Venture
KAF Korea-Australia Foundation
KAIST Advanced Institute of Science and Technology
MCRD Ministerial Committee on Research and Development
NA countries North Atlantic Countries
NBEET National Board of Employment, Education and Training
NCGP National Competitive Grants Program
NCP New Colombo Plan
NHMRC National Health and Medical Research Council
NSF National Science Foundation
OA Open Access Policy
OECD Organisation for Economic Cooperation and Development
PIRSA Primary Industries and Regions South Australia R&D Research & Development
PRIF Premier’s Research and Industry Fund
PSIC Premier’s Science and Industry Council
ROK Republic of Korea
RSEs Research Scientists and Engineers
S&T Science and Technology
SA South Australia
SAJMC Singapore-Australia Joint Ministerial Committee
SATREC Satellite Technology Research Centre
SMEs Small and Medium-sized Enterprises
US United States
USAID US Agency for International Development
VIDS Victoria India Doctoral Scholarship Program
WEHI Walter and Eliza Hall Institute for Medical Research WEHI
Executive Summary

Research & Development (R&D) forms the basis of future competitiveness of any country, as it’s critical for technological innovation. In recent years governments, private companies, universities and research centres are increasingly aware of the importance of international cooperation in R&D. These organisations are becoming progressively conscious that technological innovation and internalisation play a key role in the new economy and that they are the main drivers in creating an effervescent ecosystem. In particular what has risen to the surface is the importance of international cooperation in R&D as a long term strategy to foster socio-economic national and regional development.

There are two main concepts behind the growing awareness of the importance of international R&D cooperation. The first is that the world is dynamic, advancing quickly, and every day becoming more globalised. Impressive technological advancements experienced worldwide in recent decades have encouraged greater circulation of people, information and knowledge. The second concept is that today’s world is very competitive, and the organisations involved are always striving to find cutting-edge solutions in view of a disruptive economy, which encourages progress through innovation.

Today’s leading economies—Europe, US, Canada, South Korea, Japan, Singapore, China—are among the biggest investors in R&D, confirming that the higher the R&D intensity, the bigger the economic rebound will be. The main purpose of this research project is to explore Australian and South Australian (SA) international engagement through R&D. In the last decade, numerous efforts have been made in Australia and in SA in order to improve the state’s R&D system.

This report first gives an account of Australia and South Australia R&D current situation. Australia’s gross domestic expenditure on R&D amounts to approx. 2.1% of the GDP, with 8-9 researchers per thousands of people employed. In comparison with other larger economies, Australia is well positioned among world leading innovative countries, ranking 17th on the Global Innovation Index 2014⁴.

This report further discusses the international engagement through R&D first between Australia and North Atlantic (NA) countries, then amid Australia and Asian countries.

The relations within NA countries (Europe, US and Canada) have been prosperous with bilateral dialogues in several fields ranging from trade, education, science and innovation. NA countries have experienced a progressive growth in the level of GERD (Gross Domestic Expenditure on R&D) in the past two decades. Numerous initiatives and programs have been implemented to specifically promote R&D collaboration between the two regions.

The following Asian countries, India, South Korea, Japan, Singapore, China, analysed in the report, are experiencing an impressive economic growth which makes them highly desirable partners for an Australian-Asian international R&D engagement. They are all impressively growing in the R&D sector, with China having achieved a number of publications that is second only to the US in the last decade. The steps that have been made so far have given positive results and are leading towards the development of further joint schemes of collaboration in R&D.

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In light of an international cooperation in R&D, the report discusses talent attraction as a ‘best practice’ to encourage R&D and international collaboration, specifically through the help of foundation’s activity. The main finding of this analysis is that ultimately growth is led by highly talented individuals. Human capital has proven itself to be crucial in encouraging international R&D collaboration and technological innovation. Hence, the strategy of talent-attraction is to be considered the best practice to create network, foster innovation and consequently lead to economic growth, according to the paradigm that “talent attracts talent” (Talent Magnetism 2013). The new phenomenon of Brain Circulation is to be encouraged, as opposed to the traditional one of Brain Draining.

The activity of various foundations around the world is becoming increasingly important to promote the idea of brain circulation. More generally, there is a combined international effort by individuals required for driving technological innovation.

The benefits that Australia and SA can achieve from an intense international cooperation in R&D with the NA regions and with Asian countries are enormous. First of all, international cooperation in R&D improves research quality. Then, it is an opportunity to share large project experiences and expertise. It also enables markets to open up and to explore possibilities previously not accessible as a result of the added and compensatory value brought by the various interactions. Moreover, strengthening international connections in R&D generates high-quality knowledge, stimulates the commercialisation of research results, and consequently enables the creation of first-rate products and services, allowing innovative businesses to prosper. Finally, a crucial benefit is the creation of and access to a global network in terms of valuable contacts that are then likely to have positive flow-on effects on sectors other than research.

\[\text{\textsuperscript{2}}\text{In accordance with the new Federal Government Strategy “Boosting the Commercial returns from Research”}\]
INTRODUCTION

The Importance of International Cooperation

To invest in innovation and research is considered vital to ensure long-term prosperity and to emerge from the global crisis with an innovation-induced productivity growth; policymakers are placing innovation at the top of their agenda.¹

In recent years governments, private companies, universities and research centres have become increasingly aware of the importance of international cooperation in Research & Development (R&D). R&D forms the basis of future competitiveness of any country, as it’s critical for innovation.

These organisations are becoming progressively conscious that innovation and internalization play a key role in the new economy and that they are the main drivers in creating an effervescent ecosystem.

The main purpose of this research project is to explore Australian and South Australian international engagement through R&D. In the last decade, numerous efforts have been made in order to improve the State’s R&D system. This engagement shows the importance given to this particular way of and investing in future SA development, attracting new businesses and highly talented individuals.

As Don Russel - Chief executive at the Department of State Development (DSD) - pointed out, “central to [SA] success will be [SA] ability to create partnerships between business, government and the community” and R&D is undoubtedly a way to go towards that direction (SA Government 2015a). R&D can help support and giving substance to high-level policies by optimising the benefit of abundant SA natural and human resources. The goal is to create and attract new innovative industries willing to invest in research and science in order to develop programs that are built on SA cultural heritage, creativity and industriousness. This will help SA promote itself as an internationally competitive State worldwide.

Today’s leading economies are among the biggest investors in R&D, confirming that the higher the average R&D intensity, the bigger the economic rebound will be (Dirk Pilat 2007).

This report will first give an account of Australia and South Australia R&D current situation. Then it will address Australia’s existing international R&D cooperation - in particular with North Atlantic countries (Europe, The United States and Canada), India, China, Singapore and Japan. Finally, the report will discuss talent attraction as a ‘best practice’ to encourage R&D and international cooperation, specifically through the help of foundation’s activity.

CHAPTER 1

AUSTRALIA’S EXISTING INTERNATIONAL R&D COOPERATION

In the past decades Australia has experienced a high degree of internalization in R&D, as a result of the understanding that international cooperation is a main driver of innovation. The benefits of Australian participation in international research collaboration with North Atlantic Regions (Europe, USA and Canada) and with Asian countries such as India, South Korea, Japan, Singapore and China are to:

- Improve research quality (Access to knowledge, higher global profile)
- Large project experience (Sharing expertise, new and extended networks)
- Open up markets (Technology companies, international centres of excellence)
- Funding leverage, being more competitive locally and promoting the South Australia brand worldwide

In this chapter a general overview on Australian and South Australian current status in R&D will be given. Then, the Australian and South Australian engagement with other major world economies will be analysed.

1.1 OVERVIEW OF THE CURRENT R&D STATUS IN AUSTRALIA

Australia ranks 17th overall on the Global Innovation Index 2014. It is worth mentioning there was an improvement from 2013, when Australia was ranked 19th. The figure below gives a glimpse of Australia R&D current status compared to the one of leading economies worldwide. Australia’s gross domestic expenditure on R&D amounts to approx. 2.1% of the GDP, with 8-9 researchers per thousands of people employed. When put in comparison with other big economies, Australia is well positioned on the graph among world leading innovative countries such as USA, Japan, Germany, Belgium and France.

Figure 1: Australia R&D Status Compared to Leading Economies Worldwide

Source: OECD, Main Science and Technology Indicators Database, Brazil’s Minister of Science, Technology and Innovation and UNESCO Institute for Statistics, June 2013.

Compared with the leading OECD countries R&D level of expenditure, Australia performs competitively. Table 1 gives an account of those countries which are well-known to have the best reputation in R&D. Reported is the R&D expenditure of nine leading nations, written as a percentage of their GDP.

<table>
<thead>
<tr>
<th>Yr. 2012</th>
<th>Australia</th>
<th>Canada</th>
<th>France</th>
<th>UK</th>
<th>Germany</th>
<th>Japan</th>
<th>ROK</th>
<th>Sweden</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>GERD</td>
<td>2.13</td>
<td>1.69</td>
<td>2.29</td>
<td>1.73</td>
<td>2.98</td>
<td>3.35</td>
<td>4.36</td>
<td>3.41</td>
<td>2.79</td>
</tr>
<tr>
<td>HERD</td>
<td>0.63</td>
<td>0.65</td>
<td>0.47</td>
<td>0.46</td>
<td>0.53</td>
<td>0.45</td>
<td>0.41</td>
<td>0.92</td>
<td>0.39</td>
</tr>
<tr>
<td>BERD</td>
<td>1.24</td>
<td>0.88</td>
<td>1.48</td>
<td>1.10</td>
<td>2.02</td>
<td>2.57</td>
<td>3.40</td>
<td>2.31</td>
<td>1.95</td>
</tr>
</tbody>
</table>

Source: OECD, Main Science and Technology indicators

Australia ranks 31 on the knowledge and technology outputs indicator. This voice refers to innovative products and services resulted from new ideas from R&D (see Table 2).

<table>
<thead>
<tr>
<th>Overall ranking</th>
<th>17th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge and Technology Outputs</td>
<td>31st</td>
</tr>
<tr>
<td>Creative Outputs</td>
<td>12th</td>
</tr>
</tbody>
</table>

Source: Cornell University, INSEAD, and WIPO (2013): The Global Innovation Index 2014: The Local Dynamics of Innovation

Australia produces cutting edge research; scientists have been increasingly better connected with their peers abroad, creating a valuable international network. The challenge that Australia has to currently face is to increase collaboration and investment between companies and research institutions, so to create a strategic alliance between research centres and businesses and a general circulation of marketable knowledge.

Table 3 gives an account of businesses with an innovative activity in the years from 2010 to 2013.

<table>
<thead>
<tr>
<th>Year</th>
<th>2010-11</th>
<th>2011-12</th>
<th>2012-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>39.1%</td>
<td>46.6%</td>
<td>42.2%</td>
<td></td>
</tr>
</tbody>
</table>

Source: ABS 8158.0 Innovation in Australian Business, 2012-13

The figure below shows the investment effort from the business sector in R&D. BERD (A$ 18.3 billion in 2011-2012) is predominant in the graph, followed by HERD A$9 billion approx. in 2011-2012) GOVERD (A$3.5 billion in 2011-2012) and Private non-profit (A$0.9 billion in 2011-2012).
Overall, Australia’s Gross Domestic Expenditure on R&D is particularly promising. Between 2000 and 2010 it has increased an average of 7%, which almost triples the average OECD expenditure which is set on 2.6% (see Figure 3). This data places Australia amongst the fastest growing R&D expenditure in the world.

Figure 3: Gross Domestic Expenditure in R&D 2000-2010

Source: OECD, Main Science and Technology indicators Volume 2014 Issue 1, OECD publishing, Table 3; Austrade
The impact of Australian scientific publications in research has played an important role world-wide. Figure 4 analyses 21 Research fields and the relative impact of the research work done in Australia compared to the global average of 1.0. As shown in the figure, Australia’s strongest fields in research are materials science, plant and animal science, physics, microbiology, space science, engineering and health. Those are all key areas to innovation. Overall, Australia produces 5.5% of the world’s most cited research publications and accounts 20 of the world’s top 400 universities world-wide.

Figure 4: Relative Impact of Australia Scientific Publication by Research Field

Source: Thomson ISI, Essential Science Indicators Database, 2013; Austrade

1.2 OVERVIEW OF THE CURRENT R&D STATUS IN SOUTH AUSTRALIA

In South Australia, the Premier’s Science and Industry Council (PSIC) highlighted the importance of R&D in innovation in its report Investing in Prosperity: The role of science, research and innovation and it has supported its improvement in the light of the belief that “Investment in science, research and innovation is vital to the future economic growth and well-being of South Australia, and it is important to identify key directions that will focus effort and investment in this important area for the State”(SA Government 2014a).

The SA State Government responded to the report mentioned above with the Action Plan “Investing in Science” (January 2014). The report emphasized seven key priority areas on which to focus in the next years. These are the following (SA Government 2014a).
1. Investing in people, our current and future research leaders
2. Investing in STEM skills to drive innovation and growth
3. Investing in research to build on our strengths
4. Industry collaboration, entrepreneurship and commercialisation
5. Building strategic international partnerships
6. Increasing wellbeing through publicly funded research
7. Investing in strategic infrastructure.
Table 4 shows the expenditure on R&D in Australia and in South Australia. It also offers a comparison between the overall R&D expenditure in 2008-2009 and in 2011-2012. The table shows how there was an improvement in both Australian and SA R&D total expenditure during that time frame. This confirms a positive general trend, although there is still room for improvement.

<table>
<thead>
<tr>
<th></th>
<th>Australia (A$M)</th>
<th>South Australia (A$’000)</th>
<th>Australia (A$M)</th>
<th>South Australia (A$’000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>17,264</td>
<td>932,488</td>
<td>18,321</td>
<td>1,057,670</td>
</tr>
<tr>
<td>Government</td>
<td>3,420</td>
<td>440,758</td>
<td>3,549</td>
<td>526,163</td>
</tr>
<tr>
<td>Commonwealth</td>
<td>2,252</td>
<td>308,142</td>
<td>2,426</td>
<td>385,502</td>
</tr>
<tr>
<td>State/Territory</td>
<td>1,169</td>
<td>132,625</td>
<td>1,123</td>
<td>140,661</td>
</tr>
<tr>
<td>Higher Education</td>
<td>6,717</td>
<td>505,080</td>
<td>8,885</td>
<td>544,932</td>
</tr>
<tr>
<td>Private Non-Profit</td>
<td>744</td>
<td>2,887</td>
<td>925</td>
<td>14,275</td>
</tr>
<tr>
<td>Total</td>
<td>28,145</td>
<td>1,881,213</td>
<td>31,680</td>
<td>2,143,040</td>
</tr>
</tbody>
</table>

Source: Australian Bureau of Statistics

The Table shows as although the SA Government makes great efforts to support R&D cooperation and development, a key role belongs to private businesses. Non-Profit’s contribute is relatively minor, nonetheless it has become increasingly important too. However, the Government’s expenditure in R&D in SA is higher than the national average. This is certainly encouraged by the presence of research centres as CSIRO and CRCs in South Australia.

SA’s higher education expenditure on R&D has followed Australia’s upward trend and it is promising. SA Universities have increased their total gross value of research income in absolute terms over the last 20 years (Figure 5).

Figure 5: HERD R&D Spending (GDP %)

Source: ABS 8111.0 Research and Experimental Development, Higher Education Australia, 2012
According to the Excellence in Research for Australia 2012 ERA, the three main South Australian Universities (namely UniSA, Flinders University and Adelaide University, see Appendix 1) score a performance ‘Well above world standard’ in the following fields of research:

- Physical Sciences (Astronomical and Space Sciences and Optical Physics);
- Chemical Science (Physical and inorganic Chemistry);
- Geochemistry and Geology (Earth Sciences)
- Evolutionary Biology
- Horticultural Production (Agricultural)
- Artificial Intelligence and Image processing (ICT)
- Engineering (resources engineering and extractive metallurgy);
- Nanotechnology
- Medical and Health Sciences (Cardiovascular Medicine and Haematology, Dentistry, Medical Microbiology, Nursing, Nutrition and Dietetics, Oncology and Carcinogenesis, Paediatrics and Reproductive Medicine and Medical Physiology)
- Study and Performing in Creative Arts and Writing

Hence, overall SA strengths in R&D are in particular in Key Emerging Technology (KET) sectors, including photonics and advanced sensing, nanoscale bio photonics and technology, bio and polymer interfaces, colloids and nanostructures and mineral processing.

1.2.1 AUSTRALIAN INTERNATIONAL COOPERATION THROUGH R&D

“The vision is about (...) opening the door to new ideas, new opportunities, new people and new business. It is about taking bold actions and seizing opportunities and finding new ways of doing things.”

Premier Jay Weatherill

Australia has understood and encouraged innovation through internationalisation. In 1988 the Australian Research Council (ARC) was established as one of four constituent councils of National Board of Employment, Education and Training (NBEET) and in 2001 it became an independent body. ARC is a Commonwealth entity within the Australian Government and is in charge to manage the National Competitive Grants Program, a significant component of Australia’s investment in R&D.

Since the beginning of the National Competitive Grants Program (NCGP), the Australian Research Council has supported international collaboration through its various schemes. Text Box 1 provides with instances of international opportunities currently existing in Australia.

<table>
<thead>
<tr>
<th>TEXT BOX 1</th>
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<tbody>
<tr>
<td><strong>Linkage Program</strong></td>
</tr>
<tr>
<td>- Linkage Projects</td>
</tr>
<tr>
<td>- Linkage Infrastructure, Equipment and Facilities</td>
</tr>
<tr>
<td>- Industrial Transformation Research Program (ITRP)</td>
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<td></td>
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<tr>
<td><strong>Discovery Program</strong></td>
</tr>
<tr>
<td>- Discovery Projects</td>
</tr>
<tr>
<td>- Discovery Projects – Discovery International Awards (DIAs)</td>
</tr>
<tr>
<td>- Discovery Early Career Researcher Awards</td>
</tr>
<tr>
<td>- Australian Laureate Fellowships</td>
</tr>
<tr>
<td><strong>ARC Research Centres</strong></td>
</tr>
<tr>
<td>- ARC Centres of Excellence</td>
</tr>
</tbody>
</table>

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5 http://www.arc.gov.au/era/
Table 5 provides with examples of international collaboration in ARC-funded research since 2011.\(^8\) From the table it is clear how the collaboration with North Atlantic countries (United States, Canada and European States) and with China has been consistently strong. India is also among the top 20 Counties with whom Australia has engaged through ARC-funded research. Moreover, around 70% of the international cooperation in R&D has been engaged with North Atlantic countries\(^9\).

Appendix 2 provides with a figure which represents the percentages of Australian collaboration with foreign countries on ARC grants in the time span from 2011 to 2015.

### Table 5

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>United States of America</td>
<td>1752</td>
<td>1807</td>
<td>1829</td>
<td>1738</td>
<td>1506</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1061</td>
<td>1081</td>
<td>1116</td>
<td>1075</td>
<td>931</td>
</tr>
<tr>
<td>Germany</td>
<td>572</td>
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<td>Korea, Republic of (South)</td>
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<td>932</td>
<td>969</td>
<td>9942</td>
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<td><strong>Total</strong></td>
<td><strong>7383</strong></td>
<td><strong>7491</strong></td>
<td><strong>7660</strong></td>
<td><strong>7318</strong></td>
<td><strong>6337</strong></td>
</tr>
</tbody>
</table>

Source: Australian Government_ARC

As for South Australia, in order to support these key priorities, multiple programs have been developed. An instance is the Premier’s Research and Industry Fund (PRIF), which “aims to support South Australia’s research community to compete successfully on a national and global scale”\(^11\).

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\(^8\) Id. Note: The data in this table refers to instances of collaboration and represents all new and ongoing projects that have a funding allocation in a given year. Some projects involve collaboration with more than one country and therefore are represented more than once in these figures. The table does not include projects that may have been funded under the Special Research Initiatives scheme and the Linkage Learned Academies Special Projects scheme. For allocation year 2015, the data does not include funding rounds commencing in 2015 that are not yet complete. The information shown is limited to that which was current at the time research proposals were approved.

\(^9\) Supra.

\(^10\) http://www.arc.gov.au/general/international_collaboration.htm#NCGP

1.3 NORTH ATLANTIC ECONOMIC ENGAGEMENT - CURRENT R&D STATUS IN EUROPE

Europe’s research community is diverse, due to the large number of countries that take part to it. Central funding and administrative mechanisms coordinate the operation of the several member States and serve as a platform to create a European R&D action with its own identity.

According to the European Commission, R&D accounts for 25-30% of the total economic growth (Meng-Cerini 2014). The FP5s are the main instruments used by the EU to promote R&D. These seven-year programmes are the main financial mechanisms to enhance Europe’s global competitiveness in R&D.

Horizon 2020 identified – amongst others – the area Excellent Science (€24 billion). This area aims to be a tool for the European Research Council ERA, for future and emerging technologies and research. The EU’s objective is to increase R&D spending up to 3% of GDP by 2020. In 2010, the 27 Member States in the EU jointly spent US$267 billion on R&D, about 2% of the EU total GDP.

R&D expenditure financed by the business sector has been quite consistent in the latest years, accounting for approx. 1.2% of the EU total GDP. Table 6 gives an account of the EU’s top-10 R&D investing companies in 2012.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company name</th>
<th>Country</th>
<th>Industry</th>
<th>R&amp;D expenditure in € billions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Volkswagen</td>
<td>DE</td>
<td>Automobiles</td>
<td>9.52</td>
</tr>
<tr>
<td>2</td>
<td>Daimler</td>
<td>DE</td>
<td>&quot;</td>
<td>5.64</td>
</tr>
<tr>
<td>3</td>
<td>Robert Bosch</td>
<td>DE</td>
<td>&quot;</td>
<td>4.92</td>
</tr>
<tr>
<td>4</td>
<td>Sanofi - Aventis</td>
<td>FR</td>
<td>Pharmaceutical and Biotech</td>
<td>4.91</td>
</tr>
<tr>
<td>5</td>
<td>Siemens</td>
<td>DE</td>
<td>Electronic and electrical equipment</td>
<td>4.57</td>
</tr>
<tr>
<td>6</td>
<td>Glax Osmithkline</td>
<td>UK</td>
<td>Pharmaceutical and Biotech</td>
<td>4.23</td>
</tr>
<tr>
<td>7</td>
<td>Nokia</td>
<td>FI</td>
<td>Technology hardware and equipment</td>
<td>4.17</td>
</tr>
<tr>
<td>8</td>
<td>BMW</td>
<td>DE</td>
<td>Automobiles</td>
<td>3.95</td>
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<tr>
<td>9</td>
<td>Ericsson</td>
<td>SE</td>
<td>Technology hardware and equipment</td>
<td>3.86</td>
</tr>
<tr>
<td>10</td>
<td>Eads</td>
<td>NL</td>
<td>Aerospace and Defence</td>
<td>3.63</td>
</tr>
</tbody>
</table>

Source: Meng-Cerini 2014

Figure 6 shows the R&D intensity in OECD countries. North Atlantic countries have experienced a progressive growth in the level of GERD in the years from 1990 to 2012. This progress is still continuing nowadays.
1.3.1 AUSTRALIA – EUROPE INTERNATIONAL COOPERATION THROUGH R&D

Relations between the European Union and Australia have been prosperous with bilateral dialogues in several fields ranging from trade, education, science and innovation. Australia’s flagship contribution is per capita scientific output, which makes it an attractive partner for the EU. Despite Australia’s small population, it accounts for 3% of the world’s knowledge produced. On the other hand, the EU is a global leader in R&D, accounting for 24% of global expenditure on research.

In order to promote EU-Australian cooperation, the Australian government set up an office at the Department of Innovation, Industry, Science and Research (DIISR) in Brussels. Its objectives are twofold. The first one is to strengthen and encourage Australia’s engagement and policy dialogue with the EU, The Organisation for Economic Co-operation and Development (OECD) and European countries in the area of science, research and innovation. The second is to highlight Australian research excellence in Europe and provide advice to European and Australian stakeholders on opportunities for increasing research cooperation in areas of mutual interest.

There are many other notable accomplishments in Australia - EU cooperation that have been reached so far. In 1994 the EU and Australia signed the Science and Technology Agreement. This treaty established a Joint Science and Technology Consultative Committee (JSTCC) that meets regularly in order to exchange ideas and information, to set priorities in terms of Australia-EU bilateral cooperation and to monitor the progress that has been made. 20 years after the S&T agreement, on 1-2 December 2014, Australia hosted the 13th EU-Australia JSTCC in Canberra. During the meeting the dialogue focused on enhancing “EU-Australia research-business collaboration and impact” (JSTCC Committee meeting), giving new strength to EU-Australia previous agreements to cooperate in R&D.
Key areas of collaboration are (JSTCC Committee meeting):

- **Bio-Economy**, through the knowledge-based bio-economy forum (KBBE)
- **Research Infrastructures and Clean Energy**. In November 2013 Australia held the third Australia-EU Research Infrastructures Workshop, which had encouraging outcomes, specifically (among others) in the field of clean energy, sustainable cities, industry and healthy ageing. Carbon Capture and Storage (CSS) has been recognized as an area with a great potential in terms of bilateral international cooperation.
- **Health**, by means of the NHMRC-EU collaborative research scheme and the support given to the European Commission (EC) through Horizon 2020.
- **An Innovation Policy**, which connects Australian and European Science and Innovation Excellence through the bilateral partnership CAESIE.

The **CAESIE project**\(^{12}\) began in October 2012 under the EU’s 7th Framework Programme (FP7). CAESIE addresses some of the world’s grand challenges, such as covering clean energy, supporting healthy ageing through enabling technologies and developing sustainable cities. CAESIE is a mean to promote cooperation between Australian and European researchers and small-to-medium-sized enterprises (SMEs). Specifically CAESIE funding supports the following:

- SMEs from Europe seeking to partner with Researchers from Australia.
- SMEs from Australia looking to partner with Researchers in Europe.
- Researchers in Europe seeking to partner with SMEs in Australia.
- Researchers in Australia seeking to partner with SMEs in Europe.

Finally, the Australian-European **S&T Cooperation Roadmap 2010-2012** defined R&D priorities. Many of these were incorporated in the outcome of the 13\(^{th}\) EU-Australia JSTCC in 2014\(^{13}\). Specifically, Health, Biotechnology, agriculture and food, Environment, Energy, Information and communications technologies, Nanotechnologies, materials and production technology, Research infrastructures, Researcher mobility, networks and communication, Social sciences and humanities and Innovation policy.

The most important source of AU-EU R&D cooperation is the **EU Framework Program for Research and Technological Development**, which is the main platform for enabling multilateral research. The level of Australian participation in the Framework Projects has progressively increased over the years. The following chart gives some factual data showing this general positive trend.

<table>
<thead>
<tr>
<th>Framework Project(^{14})</th>
<th>Time Frame</th>
<th>Number of projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP4</td>
<td>1994-1998</td>
<td>60 Australian Projects</td>
</tr>
<tr>
<td>FP5</td>
<td>1999-2002</td>
<td>90 Australian Projects</td>
</tr>
<tr>
<td>FP6</td>
<td>2002-2006</td>
<td>173 Australian Projects</td>
</tr>
<tr>
<td>FP7</td>
<td>2007-2013</td>
<td>322+ Australian Projects</td>
</tr>
</tbody>
</table>

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\(^{12}\) [www.caesie.org](http://www.caesie.org).

\(^{13}\) Priorities set at the 11th JSTCC meeting, held 7–9 June 2010 in Australia

Moreover, Australia ranks 9th amongst the non-EU countries participating in the last Framework program, FP7. Australian research organisations have the second highest success rate in their applications (31% compared to the average 23%). The Australian research organisation most heavily involved is the CSIRO, which accounts for 12% of all projects involving Australians. The Group of Eight (Go8) universities collectively account for 50% of all project involvement.

To date, over 300 Australian proposals have been successful and the EU funding they have obtained is estimated to be over €5 million.

Key areas for EU-AU cooperation are Health, Food, Agriculture, Fisheries and Biotechnologies (FAFB) and Information and Communication Technologies (ICT). These account for 80% of the current cooperation within the thematic areas of the Cooperation Programme of FP7. In addition, participation is high in both Research Infrastructure projects (in particular Astronomy) and the Mobility Programmes (Marie-Curie and IRSES).

An example of research international cooperation in astronomy is the Square Kilometre Array Telescope, an international radio telescope. SKA is a massive creation that will give astronomers insights into the formation of the early Universe. The SKA will require new technology and progress in fundamental engineering fields such as information and communications technology, high performance computing and productive manufacturing techniques. As part of its Super Science Initiative, the Government will provide $80 million for the Australian National Centre of SKA Science in Perth.

With FP7 ending in January 2014, the European Commission launched its new program, Horizon 2020. The budget is €80 billion, and the goal is to match the approach being taken in most of the EU’s Member States in order to increase investment in R&D as the route to future growth. Horizon 2020 is a financial instrument realising the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe’s global competitiveness. In relation to Horizon 2020 Australia is considered as a ‘non associated industrialised third country’. This signifies that Australia can fully participate to Horizon 2020, but is not automatically eligible for EU funding. Third countries will have to cover their own participation costs. Nonetheless, if there is a bilateral agreement which provides funding for projects under a given topic or if the EU Commission exceptionally believes as essential the participation of such partners within a given project, it is possible for third countries to apply for EU funding, too15. Furthermore, a number of work programmes specifically name Australia as a preferred collaborator in one or more of the sub-calls. As mentioned above, this does not exclude Australian participants from taking part in other Horizon 2020 sub calls where Australia is not listed (See Rule of Participation, Chapter 2, Section 1, Article 10)16.

16 Article 10 Eligibility for funding 1. The following participants are eligible for funding from the Union: (a) any legal entity established in a Member State or associated country, or created under Union law; (b) any international European interest organisation; (c) any legal entity established in a third country identified in the work programme. 2. In the case of a participating international organisation or in the case of a participating legal entity established in a third country, neither of which are eligible for funding according to paragraph 1, funding from the Union may be granted provided that at least one of the following conditions is fulfilled: (a) the participation is deemed essential for carrying out the action by the Commission or the relevant funding body; (b) such funding is provided for under a bilateral scientific and technological agreement or any other arrangement between the Union and the international organisation or, for entities established in third countries, the country in which the legal entity is established”. 22
Financial Tools for International Collaboration

Australia has devoted specific funding to support cooperation with the EU. This includes:

a) **The National Health and Medical Research Council (NHMRC) - EU Collaborative Research Grants program** (AUD $1 million available under each call).
   This fund has been available since 2001, providing financial help to researchers who are part of international collaborative programs. It aims to offer assistance to Australian researchers to participate in multinational research collaborative projects with international researchers that have been selected for funding under the European Commission’s Horizon 2020 Health, Demographic Change and Wellbeing or the Seventh Framework Programme (FP7) calls. Projects involving Australian researchers based in Australia that are chosen by the European Commission (EC) for funding may be eligible for NHMRC support of up to $500,000.

b) **The Flagship Collaboration Fund for international collaboration** (more than AUD $100 million over seven years). In 2008, CSIRO received government approval to broaden the use of it.


d) **The ARC** has opened up its fellowships to international candidates for all schemes. This has resulted in several successful research projects between Australian and EU researchers, and it has given them the opportunity to strengthen their network at an international level.

The cooperation among European scientists and researchers has recently been prosperous. This is due to the European Research Area (ERA), a unified research area in which research, scientific knowledge, and technology circulate freely. European Cooperation in Science and Technology complements ERA. **COST** is an intergovernmental framework allowing the coordination of nationally-funded research on a European level. COST increases the mobility of researchers across Europe and fosters the establishment of scientific excellence. Australian researchers have participated in almost 103 COST initiatives since 2011. Most of these researchers have received funding for their participation from the Australian Government administered by the Australian Academy of Science. Today Australia is involved in about 70 COST Actions.

In the framework of Australian-EU international cooperation, efforts have been made to improve and promote collaboration in R&D. **The EU Centre initiative** is part of the European Union’s public diplomacy strategy towards industrialised countries. The EU Centre initiative seeks mainly to encourage academic exchanges with the EU and to foster coordination between the different EU Centres that have been established over time. In Australia and New Zealand, the number of EU Centres increased in 2006 with the selection of four projects - one in New Zealand and three in Australia (ANU, Melbourne University and RMIT). In 2014 there was an increase from four to six – one in New Zealand and five in Australia (in addition to the previous, two new in the University of Adelaide and the University of South Australia). This last initiative has been co-financed by the European commission with a total budget of € 4,6 million for a duration of 42 months. Each grant has been of up to € 800.000 for stand-alone applications (with or without partners), and up to € 900.000 for consortia.

The European Union funded in 2014 two European research centres in Adelaide: the Hawke EU Centre and the EU Centre for Global Affairs. The two European RCs represent an added value in international engagement. **The Hawke EU Centre** for Mobilities, Migrations and Cultural Transformations at UniSA was launched in 2014. In 2014, UniSA's Hawke Institute secured $1.5 million in funding from the

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EU for research in human displacement and refugees. The Hawke Institute is Australia’s largest research centre in the social sciences, humanities and creative arts, and it contributes to the EU’s mission to deliver globally significant research.

The EU Centre for Global Affairs at the University of Adelaide finds its main focus in the enhancement of international trade and regional cooperation in the Asia and Pacific regions, as well as the promotion of multilateral rules-based trading system and the bilateral trade and investment relationship between the EU, Australia and Asia.¹⁹

The Centre was officially launched in August 2014, and it is based in the Institute for International Trade at the University of Adelaide. The Centre has engaged in developing deep dialogue between academia, government, business and civil society within the European and Australian communities on matters of international trade and investment, economic development, and regional cooperation and integration in the Asia-Pacific region. The overall objectives of the EU Centre are to deepen the bilateral EU-Australia relationship as well as the relationship of both the EU and Australia with the Asia-Pacific region, and to support trade and investment growth and greater people movement.

In the field of R&D, Marie S. Curie Actions (MSCA) are worth a special mention. MSCA research fellowship program is a set of mobility research grant schemes funding pre-and post-doctoral researchers in Europe as well as experienced researchers. The MSCA also support industrial doctorates by combining academic research study with work in companies and other innovative training, thereby enhancing employability and career development.

The Marie-Curie Fellowship is a prestigious award aimed at fostering interdisciplinary research and international collaboration.

The 2007-2013 budget for the MSCA amounts to €4.7 billion. Nearly half the funding (48%) supports Ph.D. training for researchers, with 24% allocated to fellowships for researchers with more than four years of post-Master’s experience. The remainder supports industry-academia partnerships.²⁰

The program can take the form of Individual fellowships (IF), as Research and Innovation Staff Exchanges (RISE), or as Innovative Training Networks (ITN).

For an Australian researcher to be eligible for a MSCA European Fellowship, the host organisation for their research project must be established and located in an EU member state or associated country.²¹

The MCSA is not the only example of AU-EU cooperation and Scientific Mobility Program. In 2014, the Embassy of France in Australia offered a travel grant for early career researchers between Australia and France. The aim of this travel grant was to facilitate and develop collaboration between these two countries.²²

Appendix 3 will give an account of the most important AUS - EU Bilateral Projects previously implemented.

EU MEMBER STATE LEVEL

Australia works with the EU as a whole, as well as with individual member States. As of today, the most important research links are with Italy, the UK, Spain, Germany, France, and Switzerland. Table 8 shows the priority areas of cooperation among EU State Members.

Table 8
PRIORITY AREAS OF COOPERATION AMONG EU STATE MEMBERS

<table>
<thead>
<tr>
<th></th>
<th>Energy</th>
<th>Environment</th>
<th>Health</th>
<th>ICT</th>
<th>Food, Biotech, Agriculture</th>
<th>Materials</th>
<th>Space</th>
<th>Social Sciences</th>
<th>Transport</th>
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</thead>
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<td>X</td>
<td>X</td>
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<td>UK</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>Norway</td>
<td>X</td>
<td></td>
<td></td>
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<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Switzerland</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>EU</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<td>Total</td>
<td>20</td>
<td>19</td>
<td>18</td>
<td>23</td>
<td>12</td>
<td>7</td>
<td>13</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Source: Research, Innovation And Science: Cooperation Between EU Member States, Associated Countries, The European Union And China
Italy

Australia and Italy share a tradition of collaboration in, amongst other fields, scientific cooperation in R&D where the two countries have reached several agreements. Their first science and research relationship at a treaty level traces back to 1975, when the two Countries signed the Agreement of Cultural Co-operation23. In 2011 Italy was Australia’s 9th strongest scientific publication partner, co-authoring 911 joint scientific publications (Thomson Reuters InCitesTM, 2011).

“Our the 19th April 2013, the Australian and Italian Governments signed in Rome a Memorandum of Understanding for Cooperation in Scientific Research and Technology. This Memorandum establishes a framework for cooperation in scientific research and technology between Australia and Italy, and aims to strengthen bilateral science and research relations”24.

In early 2015 VisionArtech promoted an international contest which aimed to support innovation of bio-inspired design in the educational, cultural, social, economic and industrial fields at an international level. The project will take the form of a two-year programme and is heavily supported by Italian companies that believe in bilateral R&D cooperation25.

Moreover, a total of 28 fellowships lasting 24 months each are available within the initiative Train2Move - a new transnational mobility fellowship programme promoted by the Italian Università degli Studi di Torino - which involves post-doc researchers. Eligible are those researchers who are in possession of a MSc (Master of Science) of all nationalities. Hence, this program is open to SA researchers as well.

At a State level, the Government of South Australia signed in recent years five Memoranda of Understanding with the Italian Regional Governments of Campania (1990), Puglia (2007), Calabria (2009), Basilicata (2009) and Trento (2010)(SA Government 2015b). These MOUs (in particular with Puglia, Basilicata and the Province of Trento) have already shown promising results. Noteworthy, the Office of International Engagement, now International R&D cooperation at DSD, has hosted 34 interns from the prestigious Italian universities Bocconi, Trento University and PoliTo. The initiative is ongoing and it is an example of international cooperation in the R&D field.

United Kingdom

“The UK and Australia share a longstanding relationship, as both partners and allies”26. In 2011 the UK was Australia’s 2nd strongest scientific collaboration partner, co-authoring 3,920 joint scientific publications (Thomson Reuters InCitesTM, 2011).

In 1998 the department of Industry and Science and the British Council in Australia signed a Partners in Innovation arrangement with the purpose of improving industry innovation and technology circulation through science and technology cooperation27.

The UK Government (Foreign and Commonwealth Office), also funds a global scholarship programme called the Chevening scholarships.28 “The scholarships support study at UK universities

24 http://www.ambcanberra.esteri.it/Ambasciata_Canberra/Menu/I_rapporti_bilaterali/Cooperazione+scientificca/Politica_ricerca_e_sviluppo/
25 Collaboration with Europe_ Italy , Namely, supporters are: ADI - design ; Associazione Industriali di Monza e Brianza ; Fondazione Mike ; Isia Roma; Politecnico di Milano; Triennale Design Museum.
26 https://www.gov.uk/government/world/organisations/british-high-commission-canberra
— mostly one-year Master’s degrees — for individuals with demonstrable potential to become future leaders, decision makers and opinion formers”. Citizens of Australia are eligible to apply for the programme. Chevening Alumni are an influential global network; hence, this form of student mobility may result to be beneficial for future R&D collaborations for those alumni who engage in an academic research or industrial activity.

Another bilateral research cooperation programme is the Australian Bicentennial Scholarships and Fellowships, which awards of up to AUD$8000 to enable UK postgraduate students or academic staff to undertake a period of research or study in Australia. Postgraduate students and researchers from both Australia and the UK can apply, as long as they are registered as a post-graduate student at an Australian or UK institution. Academic staff is eligible to apply for the grant, too. This programme has the potential to enhance R&D international cooperation between Australia and the UK.

In terms of cooperation between SA and the UK, agreements are actively working between universities and research centres from the two regions. In particular the University College London - School of Energy and Resources—Australia based in Adelaide provides international education opportunities to employees, or to individuals who wish to work in these crucial business sectors.

Active and important is the cooperation in R&D field between the SA Universities and the British research centres counterparts. An instance is provided by Research Councils UK, which each year invests around £3 billion to support excellent research that has an impact on the UK, covering many academic disciplines - amongst others medicine, astronomy, physics, engineering, and the social sciences. Even though Australian-based researchers cannot directly apply for financial support, Research Councils support international collaboration. UK researchers can apply for funding in their grant applications, including travel for researchers overseas and funds to overseas organisations where there is a lack of appropriate expertise in eligible institutions.

Spain

On 14 November 2012 a Memorandum on cooperation in higher education was signed between Australia and Spain in order to promote further cooperation in the areas of student and staff exchange, scholarship awarding, researchers exchange and bilateral fellowship programmes. Examples of this cooperation are student mobility programs such as the one promoted by UniSA, with the University of Alicante. Flinders University has partnerships in Spain with Universidad de Valencia and Escuela de Negocios de Navarra. Finally, Adelaide University has exchange mobility programmes with University of Granada and University of Pompeu Fabra.

France

In 2011 France was Australia’s 6th scientific publication partner, co-authoring 1,346 joint scientific publications (Thomson Reuters InCitesTM, 2011). The Australia-France Agreement on Cultural and Scientific Cooperation forms the framework of Australian and French R&D cooperation.

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28 [http://www.chevening.org/apply/faqs#What are Chevening Scholarships?](http://www.chevening.org/apply/faqs#What are Chevening Scholarships?)
29 Id.
30 [http://www.kcl.ac.uk/artshums/ahri/centres/menizes/scholarships/absf/index.aspx](http://www.kcl.ac.uk/artshums/ahri/centres/menizes/scholarships/absf/index.aspx)
31 [http://www.research.qut.edu.au/development/find/external/international/international_funding.jsp#RCUK](http://www.research.qut.edu.au/development/find/external/international/international_funding.jsp#RCUK)
In January 2012 the governments of the two nations signed a Joint Statement of Strategic Partnership, which recognizes the value of science and innovation collaboration between Australia and France.\(^{32}\)

**Germany**

The basis for the Australia-Germany science and research relationship is the Australia-Germany Treaty on Science and Technology Cooperation, signed in 1976. The most recent government-to-government science and research summit between Australia and Germany was held on 19 October 2012 in Bonn.\(^{33}\) In 2011 Germany was Australia’s 4th strongest science collaboration partner, co-authoring 1,893 joint scientific publications (Thomson Reuters InCitesTM, 2011).

The German Government is a partner with Australia in the CAESIE project. On 28 January 2013, the Australian and German Ministers for Foreign Affairs signed a Strategic Partnership between Australia and Germany which aims to strengthen Australian-German bilateral collaboration, also in the areas of science and research.\(^{34}\)

Another source of funding is available through the DAAD (Deutscher Akademischer Austansch Dien). The DAAD supports the internationalisation of German higher education institutions in order to give young researchers the opportunity to gain international academic and research experience. Most foreign DAAD scholarship beneficiaries are master’s students or doctoral candidates.\(^{35}\)

The Humboldt Research Fellowship Program (sponsored by the Alexander Von Humboldt Foundation) supports highly qualified post-doctoral scholars of all nationalities and disciplines so that they can carry out research projects in Germany.\(^{36}\)

**Switzerland**

In 2011 Switzerland was Australia’s 11th strongest scientific publication partner, co-authoring 753 joint scientific publications (Thomson Reuters InCitesTM, 2011). In October 2013, the Department of Industry and the State Secretariat for Education, Research and Innovation of the Federal Department of Economic Affairs, Education and Research of the Swiss Confederation signed a MoU for innovation and R&D cooperation between the two nations.\(^{37}\) The goal of this MoU was to promote the collaboration between Australian and Swiss researchers on major joint international projects, including in R&D.\(^{38}\)

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33 Id.
34 Id.
35 [https://www.daad.de/de/ (unsere Mission)](https://www.daad.de/de/)
36 [https://www.daad.org/1883358](https://www.daad.org/1883358)
1.4 NORTH ATLANTIC ECONOMIC ENGAGEMENT - CURRENT R&D STATUS IN THE UNITED STATES

The United States continues to take a strong interest in R&D enterprise and in providing support for federal R&D activities. The federal government has played an important role in supporting R&D efforts that have led to scientific breakthroughs and new technologies.

President Obama’s budget request for FY2015 included $135.352 billion for research and development (R&D), a $1.670 billion (1.2%) increase from the FY2014 level of $133.682 billion. Funding for R&D is concentrated in a few departments and agencies. Under President Obama’s FY2015 budget request, seven federal agencies would have received 95.4% of total federal R&D funding, with the Department of Defence (DOD, 47.6%) and the Department of Health and Human Services (HHS, 23.0%) accounting for more than two-thirds of all federal R&D funding. (Congressional Research Service Reports 2015).

Figure 7 gives an account of the expense distribution for FY2013, FY2014, and FY2015.

<table>
<thead>
<tr>
<th>Department/Agency</th>
<th>FY2013 Actual</th>
<th>FY2014 Estimate</th>
<th>FY2015 Request</th>
<th>Change, FY2014-FY2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Defense</td>
<td>$63,838</td>
<td>$63,856</td>
<td>$64,430</td>
<td>$574</td>
</tr>
<tr>
<td>Department of Health and Human Services</td>
<td>29,969</td>
<td>30,912</td>
<td>31,069</td>
<td>157</td>
</tr>
<tr>
<td>Department of Energy</td>
<td>10,740</td>
<td>11,359</td>
<td>12,309</td>
<td>950</td>
</tr>
<tr>
<td>National Aeronautics and Space Administration</td>
<td>11,282</td>
<td>11,667</td>
<td>11,555</td>
<td>-112</td>
</tr>
<tr>
<td>National Science Foundation</td>
<td>5,319</td>
<td>5,729</td>
<td>5,727</td>
<td>-2</td>
</tr>
<tr>
<td>Department of Agriculture</td>
<td>2,116</td>
<td>2,418</td>
<td>2,447</td>
<td>29</td>
</tr>
<tr>
<td>Department of Commerce</td>
<td>1,360</td>
<td>1,632</td>
<td>1,597</td>
<td>-35</td>
</tr>
<tr>
<td>Department of Veterans Affairs</td>
<td>1,164</td>
<td>1,174</td>
<td>1,178</td>
<td>4</td>
</tr>
<tr>
<td>Department of the Interior</td>
<td>785</td>
<td>840</td>
<td>925</td>
<td>85</td>
</tr>
<tr>
<td>Department of Homeland Security</td>
<td>684</td>
<td>1,032</td>
<td>876</td>
<td>-156</td>
</tr>
<tr>
<td>Department of Transportation</td>
<td>829</td>
<td>853</td>
<td>865</td>
<td>12</td>
</tr>
<tr>
<td>Environmental Protection Agency</td>
<td>532</td>
<td>560</td>
<td>560</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>1,714</td>
<td>1,650</td>
<td>1,814</td>
<td>164</td>
</tr>
<tr>
<td>Total</td>
<td>130,332</td>
<td>133,682</td>
<td>135,352</td>
<td>1,670.0</td>
</tr>
</tbody>
</table>


Notes: Totals may differ from the sum of the components due to rounding.

R&D Priorities in the USA

The Federal Research and Development Funding shows how the Australian and the US national science programs focus on many of the same areas: namely energy, resources, defence, health, climate change, materials, and the environment. Given this and the sheer scale of science and technology investment in the US, it is not surprising that the US is Australia’s number one collaborator in science. In 2009, nearly one in six Australian papers listed a US co-author and that level of cooperation is increasing.

The benefits to Australian science are threefold: gains in access to facilities in America; rises to the profile outside Australia of its research capabilities and sophistication; and increases in access to a
huge potential market for its research-based products. Still the US also gains, which is why Australia ranks eighth as a source of international co-authors for American journal articles in science and engineering. Collaboration provides a different perspective on areas of mutual interest, and access to a unique environment and facilities in the southern hemisphere and to world-class expertise in certain strategic areas such as Antarctic climate and marine research, clinical medicine, astronomy and space science.

These shared strategic interests and values are underpinned by the dynamic trade and investment links between Australia and the United States. The United States is Australia’s second largest trading partner and largest source of investment, as well as a key regional and global partner in achieving more open markets through the WTO and APEC. People-to-people ties, including educational and cultural links, are extensive and wide-ranging, with over 600,000 business visitors and tourists travelling between Australia and the United States each year.

Figure 8 shows the increasing growth in Australian-US international research collaboration, and this trend currently continues. The US is Australia’s number one science collaboration partner, co-authoring 5,658 joint scientific publications in 2010 (Thomson Reuters InCitesTM, 2011).  

Figure 8 – Growth in Australian-U.S. Collaboration

Figure 9 shows the top pairs of collaborations involving US states with countries outside the United States. Australia-Washington is listed among the most prolific pairs of collaboration states in the time frame 2007-2011, ranking number 1 in the overall list. The AUS-WA also gets the first award for highest international collaboration strength pair. This shows how the collaboration between the US and Australia is not only increasing in terms of quantity, but also in terms of quality of the work produced. Also notable, the collaboration between the US State of California and Australia is listed among the most prolific pairs of collaboration states. The relation of Australia with two key US States like Washington and California has a great impact, as all the 50 US States are intertwined and characterized by great research collaboration.

40 Id.
In February 2011, Australia and America’s science leaders met in Washington, D.C. to explore closer science collaboration. This conference was then followed by the second Joint Commission Steering Committee Meeting on Science and Technology (JCM) on 14-15 March 2013 in Sydney. The JCM included two cross-cutting policy dialogues and six research workshops on the topics of:

1. Marine science issues
2. National water resource management
3. Information and Communications Technologies (ICT) in health
4. Enabling technologies
5. Climate and Earth observation.

The US is a world innovation leader and Australia is now helping it in meeting today’s biggest challenges. Appendix 4, divided by field of research, shows some of the most significative bilateral collaboration of past and present US-Australian cooperation in R&D.

**AUS-USA Bilateral Research Cooperation**

The most significant academic mobility research cooperation project that involves Australia and the US is the Fulbright Program. The Fulbright Program aims to bring a little more knowledge, a little more reason, and a little more compassion into world affairs and thereby increase the chance that nations will learn at last to live in peace and friendship (Senator J. William Fulbright). More than 300,000 talented people worldwide have been recognised as Fulbright Scholars. It is now the largest and one of the most prestigious educational scholarship programs in the world and operates between the United States and more than 155 countries. A new agreement was entered into in 1964 by the Australian and US government to establish the Australian-American Educational Foundation, now known as the Australian-American Fulbright Commission, funded equally by the two parties.
Today the Commission provides up to 50 scholarships for study between Australia and the US per year. Since its establishment, the Commission has awarded scholarships to more than 2,700 Australians and 2,000 Americans. Further Academic cooperation with the United States of America is represented by the 2014 Universities Australia agreement with the National Science Foundation (NSF). The agreement was signed in the US to include Australian universities in the GROW program – Graduate Research Opportunities Worldwide. GROW is a collaboration between NSF, international partners and the US Agency for International Development (USAID) to provide NSF Graduate Research Fellows with expanded opportunities to enhance professional development through research collaborations at top-calibre science and engineering research sites overseas. Support for this comes from the Australian Host University that provides a $2,500 per month for accommodation and basic living expenses in order for the eligible candidate to join the program.

Other important collaborations arise in the field of stem cell research. An AU$28-million Victoria–California Stem Cell Alliance has been formed between the State of Victoria and the California Institute of Regenerative Medicine, one of the world’s largest stem cell research organisations. It is funding projects aimed at removing some of the practical barriers to the therapeutic application of stem cells, such as investigating how stem cells might be used to treat multiple sclerosis, Alzheimer’s and Parkinson’s disease.

In 2010, the Walter and Eliza Hall Institute for Medical Research (WEHI) in Melbourne signed a tripartite agreement with the world’s oldest biotechnology company, Genentech of San Francisco, and pharmaceutical company, Abbott of Illinois, to develop better cancer treatments and drugs.

Finally, it is worth mentioning that the US Bill and Melinda Gates Foundation has invested tens of millions of dollars into Australian studies and research activity on topics as diverse as the elimination of the mosquito-based transmission of dengue fever, the development of vaccines against HIV and malaria, and the production of nutritionally enhanced bananas.

SA – USA Bilateral Relationship

The US and SA bilateral relations have been prolific in recent years. Their collaboration encompasses several diverse R&D areas. Pharmaceutical Research and Manufacturers in the US have invested more than half a trillion dollars in R&D since 2000, including an estimated $48.5 billion in 2012. As the development of Adelaide’s health and biomedical precinct on North Terrace continues to advance, it is envisaged that the US will be an important investment and R&D partner for South Australia in this sector.

In September 2014 South Australia became the first Australian city to sign on to an ‘Internet of Things Innovation Hub’ under a three-way Memorandum of Understanding between the Californian networking equipment giant Cisco, and the Adelaide City Council. The creation of the Innovation Hub will provide a physical space for entrepreneurs and start-ups to collaborate, develop and test applications for new methods of smart communication. Under the Internet of Things, creators will enable everyday devices to communicate with each other via the Internet to perform a function. For example, a smart phone can be used to alert drivers to available parking spots in a programmed car park. Network infrastructure and expertise will be provided by Cisco, further building Adelaide as a smart city.

https://www.universitiesaustralia.edu.au/global-engagement/international-collaboration/scholarships/Graduate-Research-Opportunities
Country Profile: USA, SA Governmental source
Exchange & Research agreements between SA Universities and US Universities

The SA government has made significant efforts to establish academic relations with the US. In 2006 the prestigious Carnegie Mellon University was the first American university to open a campus in Australia, within the “Adelaide’s University City” initiative. The SA government also worked to allow the opening of a branch of US based Laureate University, Torrens University Australia.

Numerous Exchange and Research agreements between South Australian Universities and United States Universities have been implemented in the past decade. The University of South Australia has made several international agreements with the following US universities: Northern Arizona University (NAU); University of Arizona; Centre for Applied Linguistics (CAL) and Kansas State University.

Also Adelaide University has made important following international agreements with US universities. These are the following: College of William and Mary (VA); Colorado School of Mines (CO); Cornell University (NY); Indiana University (IN); North Carolina State University (NC); Pace University (NY); Purdue University (IN); Pitzer College (CA); Simpson College (IA); Texas A&M University (TX); University of Arizona (AZ); University of California (CA); University of Connecticut (CT); University of Denver (CO); University of Illinois at Chicago (IL); University of Illinois at Urbana-Champaign (IL) and University of Massachusetts Amherst (MA).

Flinders University of South Australia has the follow international agreements currently active with U.S. universities: AIC Internship; AIM Overseas; Butler University; CISaustralia; East Carolina University and James Madison University, Harrisonburg. It also has a well-known centre for United States and Asia Policy Studies.

USA and SA engaged in further projects and collaborations in the field of R&D. Table 9 shows the details of this cooperation (DPC 2015).

<table>
<thead>
<tr>
<th>Region</th>
<th>Activity/agreement</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York (NY) USA</td>
<td>Research &amp; Development contract with CHDI Foundation Inc (New York, USA)</td>
<td>Ovine Model of Huntington’s Disease project</td>
<td>ACTIVE 1/10/2009 to 30/9/2011 New five-year agreement 14/12/2011 to 14/12/2016</td>
</tr>
</tbody>
</table>

Future joint projects

Adelaide-based biopharmaceutical company Bionomics is preparing to accelerate development of a new drug for the treatment of anxiety and depression. Bionomics has received $US10 million in funding from the U.S. Silicon Valley Bank for the development of the drug, with approval to begin a Phase 1b human clinical trial in France.

South Australian Company Zen Energy Solutions is involved in a joint venture initiative with U.S.-based Greensmith Energy to develop high density energy storage systems. The technology will allow base load power for the first time to be economically generated from renewable energy, and will enable energy utilities to manage peak loads in the world’s power grids, as well as residential systems, allowing consumers to generate, store and use their own power at home.
1.5 NORTH ATLANTIC ECONOMIC ENGAGEMENT - CURRENT R&D STATUS IN CANADA

"The Government supports an innovative economy and the creation of high-quality jobs through investments in education and training, basic and applied research, and the translation of public research knowledge to the private sector"

-Budget 2012

Despite its small population - 5% of the world total – Canada produces more than 4% of the global knowledge. Since 2006, over $9 billion have been invested in support of R&D\(^\text{45}\). The breakdown of R&D expenditure in 2011 will follow (Statistics Canada 2012):

- business R&D spending: $15.6 billion, 51 per cent of total R&D spending in Canada
- higher-education R&D spending: $11.3 billion, 38 per cent
- government R&D spending: $2.9 billion, 10 per cent

Although business R&D spending is predominant, higher-education R&D spending scores impressively as well. In facts, the OECD average for the higher-education share of a country’s overall R&D spending was 19 per cent in 2010. The great higher-education R&D expenditure gives Canadian scientists a good margin in terms of fund availability for their researches. Figure 10 shows the trends in R&D spending in Canada divided by type, as a percentage of Canadian GDP.

Figure 10: R&D Spending in Canada by Type

Source: http://www.conferenceboard.ca

Figure 10: R&D Spending in Canada by Type

R&D Priorities in Canada

R&D priorities in Canada were identified by The Canadian Trade Commissioner Service to be:

- Environmental Sciences and Technologies
- Information and Communications Technologies
- Life Sciences and Biomedical Technologies
- Energy Sciences and Technologies

\(^{45}\) The Canadian Trade Commissioner Service, http://www.tradecommissioner.gc.ca/
1.5.1 AUSTRALIA–CANADA INTERNATIONAL COOPERATION THROUGH R&D

Canada is Australia’s 5th strongest scientific collaboration partner. Australia and Canada co-authored 1,665 joint scientific publications in 2010 (Thomson Reuters InCitesTM, 2011).

The Australian Government does not have a formal agreement for bilateral science and research cooperation with Canada. Nonetheless, there are strong institutional historical and cultural links between the two nations, with more than 180 formal agreements between Australian and Canadian universities.

In November 2010, Australia held the opening Australia-Canada Economic Leadership Forum which brought together business people, academics and journalists to explore new opportunities for R&D co-operation.

In July 2012, Secretary Dr Don Russell visited Canada and met with the Canadian Minister of State for Science and Technology, the Canada Foundation for Innovation and the National Research Council Canada in order to set the basis for new future collaborations between the two nations.

AUS-Canada R&D Relationship

Educational links between Canadian and Australian Universities have always been pretty strong. Australia’s 2014 International agreements identifying 310 settlements between Australian universities and Canadian institutions covering student exchange and academic and research collaboration. There are more than 130 members of the Association for Canadian Studies in Australia (and in New Zealand). There were almost 4,300 Canadian student enrolments in Australia in 2013. The majority of Canadian students were enrolled in higher education programmes and were sciences. There are also a number of Australian universities that allow Australian qualifications in Canada. An example is provided by Charles Sturt University (ON).

Such initiatives helped greatly Australian and Canadian universities in advancing. For instance, the University of Newcastle and the University of Calgary obtained a Discovery Project Grant from the Australian Research Council, while the University of Canberra and Trent University were awarded a Social Science and Humanities Research Grant from the Canadian Government to support their studies (see footnote to learn more about funding opportunities).46

Instances of partnerships are the ones established with PhD students, individual researchers, professors and collaboration between staff to develop formal international student exchange programs are included too.

A wide range of funding is available from the Australian and Canadian governments to support institutional partnerships and research collaborations between Australia and Canada. Endeavour Scholarships are a clear example of such funding. They are the Australian Government’s internationally merit-based scholarship programme that provides up to AUD $272,500 for study, research or professional development opportunities.47


47 More about funding opportunities (Canadian Funding Opportunities for Collaborative Research and Australia-Canada Scholarships Funding at http://ors.ok.ubc.ca/funding/international/australia.html)
SA-Canada R&D Relationship

South Australia has stipulated no less than two important agreements with the Canada in the field of R&D. They led to the development of further projects and collaborations between the two States.

Table 10 shows the details of that cooperation.

<table>
<thead>
<tr>
<th>Activity/Agreement</th>
<th>Brief Description</th>
<th>Current status / Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoU (2009) signed by Dr Paul Heithersay, Deputy Chief Executive Officer, PIRSA and Dr George Patterson, Executive Director, Geological Survey of Saskatchewan, Canada.</td>
<td>The MoU forms an important alliance between the mineral resources agencies of South Australia and Saskatchewan. Saskatchewan and South Australia together account for the vast majority of the world’s uranium production. The MoU establishes formal exchange on uranium geoscience, exploration and regulation.</td>
<td>ACTIVE. Active collaboration has occurred between 2009-2011 including personnel exchange, collaborative project work and extensive precompetitive data delivery. Future ongoing collaboration includes regulatory expertise exchange.</td>
</tr>
<tr>
<td>The Government of Manitoba, Canada</td>
<td>MoU provides a general framework for co-operation between sub-national governments. Original Agreement identifies the follow priority areas: - public administration and governance - industry, trade and tourism - education and training - energy, science and technology - environment and sustainability - Social inclusion. Ancillary MoU focuses on: climate change adaptation and water resource management.</td>
<td>ACTIVE. Signed - 09/04/2006 for 5 years + auto extension for 5 yrs. Ancillary MoU signed Dec 2009 for 5 years with provision for further 5 years on exchange of letters. Ongoing activity primarily through exchange of staff in water resource management.</td>
</tr>
<tr>
<td>Collaborative project with researchers in Manitoba via DFEEST</td>
<td>Brassica Development for New Markets and Climate Change</td>
<td>Concluded. Signed – 21/08/2008 Expired – 30/06/2011</td>
</tr>
</tbody>
</table>

Source: Dept. of the Premier and Cabinet – office of international engagement 28.5.2015
1.6 ASIAN ECONOMIC ENGAGEMENT - CURRENT R&D STATUS IN INDIA

According to the Global Innovation Index (GII), India is ranked 76th among a total of 143 Countries (Ibef.org). Figure 11 shows the main R&D clusters in India, namely Delhi, Ahmedabad, Mumbai, Pune, Bengaluru, Chennai and Jamshedpur.

Figure 11: R&D Clusters in India

Source: Ibef.org

Figure 12 shows India’s trend in R&D expenditure from 2012 to 2014. R&D expenditure increase was of $4Billion in the time span from 2012 to 2014.

Figure 12: India’s R&D Expenditure (2012 – 2014)

Source: Ibef.org

R&D Priorities in India

The government is investing to set up research centres dedicated to R&D in growing fields such as:

- Agriculture sector
- Pharmaceutical sectors
- the Indian IT industry

1.6.1 AUSTRALIA – INDIA INTERNATIONAL COOPERATION THROUGH R&D

In the past two decades, India has been one of the fastest growing economies in the world. Its economy is estimated to continue to grow strongly over the next five years. India is a highly desirable international R&D partner for Australia and specifically for South Australia.

48 http://www.ibef.org/industry/research-development-india.aspx
AUS-India R&D Relationship

At a national level, India and Australia have been engaging in important R&D partnerships over the past few years, showing great potential for Australia-India collaboration and joint research. Specifically, the latter aims to involve companies, research-institutions and universities. Table 11 gives an outline of the main bilateral cooperation partnerships that have been developed so far between Australia and India in the field of R&D.

<table>
<thead>
<tr>
<th>Name Of The Company</th>
<th>Partnership With Australian Companies Or Research Centres</th>
<th>Purpose</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tata Group</td>
<td>Partnership with emerging Australian clean technology companies, including Geodynamics, Exergen, Dyesol and Sunengy</td>
<td>Development of new technologies and solutions to apply in the clean technology sector.</td>
<td></td>
</tr>
<tr>
<td>Mahindra Reva</td>
<td>Partnership with Swinburne University, La Trobe University and the Australian Auto Collaborative Research Centre</td>
<td>Undertaking of research in Australia to develop the next generation of zero-emissions mobility solutions.</td>
<td></td>
</tr>
<tr>
<td>Thermax</td>
<td>R&amp;D investments with CSIRO and the University of New South Wales</td>
<td>Development of nanostructured semiconductors and their deployment in solar receiver-thermoelectric generators.</td>
<td></td>
</tr>
<tr>
<td>The Government of India’s Department of Biotechnology</td>
<td>Partnership with Queensland University of Technology</td>
<td>Development of new strains of iron-rich bananas to address malnutrition and major health issues in India.</td>
<td></td>
</tr>
</tbody>
</table>

Australia and India also have a strong connection through the Australia-India Strategic Research Fund (AISRF). The fund allows Australian researchers from both public and private sectors to collaborate with Indian researchers in front-line scientific workshops and above all research-projects. “The AISRF is Australia’s largest fund dedicated to bilateral research with any country and one of India’s largest sources of support for international science” 49. With a total commitment from the Australian Government of $84 million over 13 years, the Australia-India Strategic Research Fund (AISRF) is Australia’s largest bilateral science fund. Additional $20 million AUD will be devoted by the Australian Government to the fund over four years from the 2015-16 FY. Currently, the maximum funding available to Australian applicants for a collaborative research project is $200,000.

Moreover, the Australian Trade Commission 50 is in charge – amongst other tasks - to facilitate cooperative research and partnerships with Australian companies, research institution/universities. 51 In fact, the named Commission has recently organised The Australia – India Innovation Forums to promote Australia as a destination for innovation and R&D Investment amid Indian corporates. The forum was held in New Delhi and Mumbai and it focused on “Australia’s R&D capabilities with specific focus on Australia-India collaboration, joint research, partnerships for development and commercialisation of new technologies, products & services involving Australian research institutions & universities”. 52

50 Austrade, is the Australian Government’s trade, investment and education promotion agency.
SA - India R&D Relationship

“Our state’s relationship with international partners will be vital to our economic growth and future prosperity– and India is at the top of the list of the partners that can contribute most to South Australia”.

Jay Weatherill, Premier of South Australia

India outstanding growth is playing an increasingly important role in strengthening its partnership with South Australia. SA sees India as a long-term partner in R&D, especially considering India’s enormous economic potential and interest in R&D. Nonetheless, it is not just India’s incredible recent growth that makes it a desirable partner for Australia, but also the advantages of engaging with a country where English is commonly used and that has a like-minded legal and education system. India is now SA third largest goods export market, the second largest source of international students and number one source of skilled migrants (ABS data 2014).

The bilateral international partnership between SA and India has been sealed by means of several MoUs throughout the years. Table 12 gives a glimpse of them.

<table>
<thead>
<tr>
<th>Tamil Nadu Government</th>
<th>Promote and expand cooperation; collaborate projects.</th>
<th>ACTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoU - the Confederation of Indian Industry (CII) and Department of Trade and Economic Development.</td>
<td>Overlapping interest in the civil aviation, defence, space, and security industrial bases of India and South Australia. CII will recognise DTED, as a major portion of Aust’s defence industry. DMITRE will recognise the CII as a national organisation in India, which represents a wide range of the aerospace, defence and security industries in that country. Sharing of information. CII and DTED will organise inward and outward trade missions on a regular basis.</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>India National Institute of Event Management, Mumbai and TAFE SA</td>
<td>NIEM delivers a variety of event management programs in Mumbai India. TAFE SA provides two additional units of competency to enable NIEM to deliver an event management program at the same level of the TAFE SA program. Students completing the program and wishing to transfer to Adelaide gain recognition for their studies with NIEM. NIEM pay TAFE SA a royalty based on student numbers.</td>
<td>ACTIVE</td>
</tr>
</tbody>
</table>

In July 2014, a SA-India engagement strategy was released. Common key opportunities in terms of SA-India bilateral R&D partnership were highlighted. Specifically, in the field of:

- Aerospace and Defense
- Energy and Natural Resources
- Clean Technology. This includes renewable energy (solar and wind power), water and wastewater sectors)
- Higher Education and training
Financial Tools for Bilateral International Cooperation

The common key opportunities highlighted in the SA-India engagement strategy can be achieved by mean of at least four important financial instruments:

a) **The Strategic Research Fund** (previously discussed).

As of February 2015, at least two SA-India bilateral research Projects were successfully Funded under the Australia-India Strategic Research Fund (Table 13)^53:  

<table>
<thead>
<tr>
<th>AUS Lead Organisation</th>
<th>Indian Lead Organisation</th>
<th>Field Of Study</th>
<th>Research Project Title</th>
<th>Activity Type</th>
<th>AUS Project Manager Name</th>
<th>AUS Govt Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flinders University of South Australia</td>
<td>International Centre for Genetic Engineering and Biotechnology</td>
<td>Agricultural Research</td>
<td>Harnessing the plant-microbiome for drought tolerance and improved wheat productivity in Australian and Indian environments</td>
<td>Collaborative Research Project</td>
<td>Professor Christopher Franco</td>
<td>$200,000</td>
</tr>
<tr>
<td>University of Adelaide</td>
<td>Indian Institute of Science</td>
<td>Vaccines, immunomodulators and immunotherapeutics</td>
<td>Preclinical trials of a quadrivalent hepatitis C virus vaccine</td>
<td>Collaborative Research Project</td>
<td>Professor Eric Gowans</td>
<td>$200,000</td>
</tr>
</tbody>
</table>

b) **The Discovery Projects (ARC initiative).** The scheme provides funding for international innovative research projects that can be carried out by individual researchers or by research teams. The main objectives of the program include supporting high profile applied research by individuals and teams, “enhanc(ing) international collaboration in research and foster(ing) the international competitiveness of Australian research”^54.  

Table 14 below gives an insight on the level of ARC international research collaboration that has been achieved both in Australia and in South Australia as of 5 June 2015.

<table>
<thead>
<tr>
<th>All ARC Projects in Australia</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>2012</td>
</tr>
<tr>
<td>95</td>
<td>81</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ARC Projects Administered By South Australian Institutions</th>
<th>and percentage of the total</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>6,3%</td>
<td>6,2%</td>
</tr>
</tbody>
</table>


^54http://www.arc.gov.au/ncgp/default.htm
c) **The Grand Challenge Fund** was designed to support collaborative projects of significant scale and ambition that would deliver practical solutions to some of the key challenges shared by both Australia and India. Health, Energy, the Environment and Food and water security have been the key themes so far.

d) The AIC is also currently designing a **New Australian Studies Fellowships Program**. It welcomes funding applications from individuals and organisations, in Australia, for projects which aim to promote long-term contact and cooperation between Australia and India. AIC grants are intended to offer funds for innovative proposals. The Council will generally award grants between AUD 20,000 and AUD 50,000.

A small number of South Australian students, researchers and organisations have been awarded funds through this program from our public Universities such as Flinders and UniSA.

**Exchange & Research agreements between SA Universities and Indian Universities**

"India and South Australia are major investment and trade partners and are increasingly working together in the areas of knowledge, innovation, research and cultural engagement".

International education is the state’s largest service sector export and the fourth largest overall export, behind wine, copper and passenger vehicles (SA Government 2012).

India is the second largest source market for South Australia, with a total of 3,137 Indian students studying in SA, compared to 48,896 nationally for the full year 2013 (SA Government 2014b). Indian students comprise 11.7 per cent of all overseas students currently studying in SA (SA Government 2012). These data show how SA has been highly successful in the attraction of Indian students to the State.

On June 14, SA Minister Gail Gago from the Minister For Employment, Higher Education And Skills announced that the 2015-16 FY State Budget will include $5.7 million over four years for a new campaign that will market SA as a desirable destination for international students (News Release SA Govt 2014).

The campaign intends to improve South Australia’s competitiveness in attracting international students from key Asian markets to boost – amongst other- education institutions, and R&D opportunities.

The figure below highlights ways and places where to identify opportunities for participation by South Australian universities, private higher-education and vocational education providers, in the Indian education.

**Figure 13: Opportunities for Participation by SA Institutions in the Indian Education**

![Figure 13: Opportunities for Participation by SA Institutions in the Indian Education](http://www.research.qut.edu.au/development/find/external/international/AISRF.jsp)

http://gcgh.grandchallenges.org/GrantOpportunities/Pages/default.aspx


The following figure shows niche markets to attract Indian students and researchers to SA.

**Figure 14: Niche Markets to Attract Indian Students and Researchers to SA**

An insight of the main bilateral partnership at a University level will follow. The analysis looks at the Opportunities and links available that could help develop long-term bilateral international partnerships between South Australia and India. Specifically, collaborations, industry links, educational partnerships and student mobility are to be encouraged in order to boost opportunities for Australian students and researchers to cooperate with Indian ones.

**UniSA Activities**

UniSA has a productive partnership with Indian Institutions in terms of student Mobility Programs; **Table 15** highlights the main opportunities in that sense.

<table>
<thead>
<tr>
<th>Table 15</th>
<th>MOBILITY PROGRAMS BETWEEN UNISA AND INDIAN INSTITUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Master of Business Administration (MBA)</strong> students will be able to go on exchange to India thanks to a new reciprocal agreement in the final stages of discussion with the Management Development Institute (MDI), India.</td>
<td></td>
</tr>
<tr>
<td>Long standing student exchange relationship with Madras Christian College for reciprocal Social Work student placements – 31 students have come to UniSA since 2007 and 16 UniSA students have gone to India.</td>
<td></td>
</tr>
<tr>
<td>UniSA’s Division of IT, Engineering and the Environment won Australian Government Student Mobility Funding in 2014 for two students to do a short term research lab project at the IBM Research Lab, New Delhi.</td>
<td></td>
</tr>
</tbody>
</table>
UniSA was a pioneer among Australian universities in engaging and collaborating with India’s research institutions.  

<table>
<thead>
<tr>
<th>Institute</th>
<th>Field of Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>India Institute of Technology (IIT), Bombay</td>
<td>Research collaboration in transport systems, civil and water engineering, cognitive Neuro-Engineering research.</td>
</tr>
<tr>
<td>Waaree Energies Pty Ltd</td>
<td>Research collaboration in renewable energy technologies.</td>
</tr>
<tr>
<td>Jawaharlal Nehru University (JNU)</td>
<td>Research collaboration with the Division of Education, Arts and Social Sciences, through the international centre for Muslim and non-Muslim understanding and Hawke Research Institute.</td>
</tr>
<tr>
<td>Indian Institute of Technology (IIT), Delhi</td>
<td>Research collaboration with the Mawson Institute, across Engineering, chemical and materials sciences.</td>
</tr>
<tr>
<td>Tamil Nadu Agricultural University (TNAU)</td>
<td>Research collaboration in nanotechnology including sensors for environmental monitoring and detection of soil contamination, led by UniSA’s Centre for Environmental Risk.</td>
</tr>
<tr>
<td>Indian Institute of Science Bangalore</td>
<td>Australia-India Strategic Research Fund (AISRF) grant. Collaborative activities in the area of physical chemistry, surface engineering, and nanotribology. Active research collaboration with a number of staff at the Ian Wark Research Institute.</td>
</tr>
</tbody>
</table>

**Other Links and partnerships between UniSA and Indian research institutions**
- Delivering of professional development courses on Systems Engineering to staff and students at Defence Institute of Advanced Technology (DIAT) University.
- PSG Institute of Advanced Studies / PSG College of Technology – relationship includes joint conferences, student/staff inbound programs, and PSG hosted a UniSA led winter school on Systems Engineering in 2013.
- A joint Computational Neuro Science laboratory was opened in 2013. Discussions have taken place to develop a joint UG program in Mechatronics (Robotics) and establish a cross institutional institute in Water Sciences & Environmental Remediation between TNAU, UniSA and PSG/Anna University.

**Adelaide University Activities**

Adelaide University offers scholarships to support the full-time post-graduate education of promising Indian students in the areas highlighted in the governmental engagement strategy 2014 (see above). The main grant offered is called **Ashok Khurana Scholarship for Outstanding Indian Students**, and it amounts $25,000 for one year besides of a considerable discount on the tuition fees for one year of their program. Moreover, Adelaide University offers a number of scholarships to international students, to which Indian students and researchers can apply. **Table 17** shows them at a glance.

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63 http://www.international.adelaide.edu.au/choosing/scholarships/
Table 17
POSTGRADUATE RESEARCH SCHOLARSHIPS AVAILABLE TO INTERNATIONAL STUDENTS

<table>
<thead>
<tr>
<th>Scholarship</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adelaide Graduate Research Scholarships</td>
<td>Available to Adelaide University recent graduates to continue their education via a Masters or Doctorate degree by research.</td>
</tr>
<tr>
<td></td>
<td><strong>The AGRS Provides:</strong></td>
</tr>
<tr>
<td></td>
<td>• Course tuition fees</td>
</tr>
<tr>
<td></td>
<td>• An annual living allowance ($25,849 in 2015) for the normal duration of the program.</td>
</tr>
<tr>
<td>Adelaide Scholarships International</td>
<td>Available in the four scholarship rounds to international applicants from any country.</td>
</tr>
<tr>
<td></td>
<td><strong>The ASI provides:</strong></td>
</tr>
<tr>
<td></td>
<td>• Course tuition fees An annual living allowance ($25,849 in 2015) for the normal duration of the program.</td>
</tr>
<tr>
<td>Full Fee Scholarships</td>
<td>Applicants Must be nominated by their Principal Supervisor and Executive Dean. Full fee scholarships.</td>
</tr>
<tr>
<td>International Postgraduate Research Scholarships (IPRS)</td>
<td>Available to international applicants from any country who have a First Class Honours result or equivalent, to support their study towards a Higher Degree by Research in areas of University research strength.</td>
</tr>
<tr>
<td></td>
<td>• Course tuition fees</td>
</tr>
<tr>
<td></td>
<td>• All successful IPRS applicants will also receive an Australian Postgraduate Award (APA) which provides an annual living allowance of $25,849 in 2015 for the normal duration of the program.</td>
</tr>
<tr>
<td>The Endeavour Postgraduate Awards</td>
<td>Provide full financial support for international students to undertake a postgraduate qualification at a Masters or PhD level either by coursework or research in any field of study in Australia.</td>
</tr>
<tr>
<td>International Centre of Excellence in Water Resource Management Scholarships (ICEWARM)</td>
<td>ICE WaRM offers a scholarship programme to attract high quality international students to education and training in water resources management.</td>
</tr>
</tbody>
</table>

**Flinders University Activities**

Flinders University offers a set of projects that support Australian student mobility, engaging in leadership and work experience programs in Asian countries. In particular, it is involved with the Academic Internship Council (AIC) of Mumbai, India, to provide a customized internship to Flinders students. This can be a good opportunity to encourage future engagements between SA and Indian institutions.

1.7 ASIAN ECONOMIC ENGAGEMENT - CURRENT R&D STATUS IN SOUTH KOREA

With many countries in the world struggling to pursue economic growth, the latter is increasingly accelerating in South Korea (ROK).

Morgan Stanley’s economists Sharon Lam and Jason Liu recently declared and acknowledged that “(South) Korea’s emphasis on R&D is the main driver that has been bolstering its global competitiveness. Korea has seen the fastest growth in R&D expenditures among OECD countries over the last decade. It now ranks first in OECD in terms of R&D intensity (expressed as R&D spending as % of GDP), which replaced a long-standing position held by Israel before 2012. We believe R&D will continue to see increasing share of GDP growth contribution in Korea in the years to come.”

Figure 15 shows the rising share of R&D investment in Korea’s GDP. It is worth to notice the outstanding hike experienced in the investment ratio between 2000 and 2013, which went from 2.3% of the total GDP to almost 4.5%.

![Figure 15: Rising Share of R&D Investment in Korea’s GDP](source.png)

South Korea’s proximity with China, which offers manufacture at lower prices, has had an impact in making South Korea aim to produce high quality products, by investing in R&D in order to face the Chinese competition.

Figure 16 gives a visual idea of Korea’s R&D investment in recent years by comparing it to the investment effort made by its peers. South Korea (in blue) stands out immediately and confirms the success of the “Winning with R&D” strategy the country has been implementing.

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The benefits of the R&D spending are twofold. On one side the effect of R&D is tangible and it results in better products. But there are more indirect factors to be considered as assets of an increased R&D expenditure, such as the boost in exports. As Economists Lam and Liu pointed out, “The much-enhanced technology and design are the keys to help Korean exporters to compete on quality rather than on price, in our view. As a result, Korea’s exports have seen little to almost no impact from the substantial JPY depreciation over the last 18 months” (Economists Lam and Liu, Business Insider Australia).

R&D Priorities in South Korea

R&D priorities in South Korea can be inferred by looking at the data relating to its major areas of industrial expertise. Strong in South Korea are the following sectors:

- Electronics
- The automotive industry
- Shipbuilding industry

South Korea is a global leader in electronics, especially semiconductors, of which is the world’s largest producer. Samsung is the emblem of South Korean world-class expertise in electronics. In fact, Samsung Electronics and Hynix Semiconductor are global leaders in the production of memory chips. South Korea is famous for being the world’s sixth largest manufacturer of electronic goods (televisions, microwave ovens, PCs etc.).

The automotive industry also plays a major role in the South Korean economy today. South Korea is the fifth-largest car manufacturer, after the United States and Germany, with an estimate of 4.27 million automobile produced a year. Some of South Korea’s international automobile brands include Hyundai, Kia and Renault.

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South Korea is a global player in shipbuilding, with a 50.6% share of the global shipbuilding market in 2008. Four of the world’s largest shipbuilding companies are from South Korea: Hyundai Heavy Industries, Samsung Heavy Industries, Daewoo Shipbuilding & Marine Engineering and STX Offshore & Shipbuilding. Even Europe’s largest shipbuilder, STX Europe, is owned by South Korea. In 2012 ROK was Australia’s third-largest export market and Australia was South Korea’s sixth-largest source of goods imports, as 7.2% of all Australian exports are sent to South Korea.

1.7.1 AUSTRALIA–SOUTH KOREA INTERNATIONAL COOPERATION THROUGH R&D

The international cooperation between South Korea and Australia stems from Australia’s participation in the United Nations (UN) Commissions on Korea in 1947. Australia-ROK relationship was strengthened by Australia contribution to fight the North Korean invasion of South Korea thanks to the help of the British Commonwealth Occupation Force.

AUS-South Korea R&D relationship

In 1961 South Korea and Australia engaged in the first significant diplomatic relations. As a consequence, the ROK Consulate-General in Sydney was elevated to an embassy status. On the other hand, Australia opened an Embassy in Seoul, in 1962. Since then, the politic and economic cooperation between the two nations has progressively increased. In occasion of the 50th anniversary of diplomatic relations, Australia and South Korea nominated 2011 as "Year of Friendship". Connections were further strengthened in 2012, by Australia’s participation in the World Expo. Bilateral trade and investment relationships have been playing an increasing role in recent years, determining a greater role of R&D as an indirect consequence.

The most relevant MoU between Australia and ROK was signed in Seoul on 16 December 2009. It is on Development Cooperation and it aims to provide a framework for greater cooperation on development assistance (MoU 2009). The signing has an iconic value, as it acknowledges ROK as an official Australian partner in Asia and it paves the way to explore ways to develop bilateral international collaboration in R&D, too. The Strategic framework pursued by the MoU can be summed up in Figure 17 (Source: Australian Government, Department of Trade and Investment).

Figure 17: The Strategic Framework Pursued by the MoU

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Financial Tools for Bilateral International Cooperation

The Partnerships between Australia and ROK bilateral international cooperation is encouraged by means of the following important institutions and instruments.

- **The Korea Foundation**

  The Korea Foundation was established by the Korea Foundation Act, promulgated on December 14, 1991. Its goal is to enhance the image of Korea in the world and also to promote academic and cultural exchange programs. It is an independent organisation strictly connected with the Korean Ministry of Foreign Affairs. The mission of The Korea Foundation is to promote international cooperation, including in the field of R&D.

  Table 18 gives an account of the activities promoted by the Korea Foundation.

<table>
<thead>
<tr>
<th>Program</th>
<th>Details</th>
</tr>
</thead>
</table>
| Fellowships                                  | • Field Research  
|                                              | • Graduate Studies  
|                                              | • Postdoctoral Research                                                 |
| Support for Korean Studies Overseas          | • KF Global e-School  
|                                              | • Support for Establishment of Professorships  
|                                              | • Support for Employing Teaching Staff and Visitor Professors           |
| Other Programs and Initiatives               | 1. Inviting Distinguished Individuals from Overseas                      |
|                                              | 2. Grant Support for K-Publications in non-Korean language               |

*Source: 2016 KF Program Guidelines*

- **The Korea-Australian Foundation and the Australia-Korea Foundation**

  In 1991, the Government of the ROK announced the formation of the Korea-Australia Foundation (KAF). The Board of the KAF includes high-profile Korean representatives from the Government, the academic and business world\(^70\). The KAF supports overseas Korean Studies program as well as numerous academic conferences and international cultural programs.

  The Australia-Korea Foundation (AKF) is the Australian counterpart of the KAF. It was established by the Australian Government in 1992 in order to promote bilateral relations between Korea and Australia. The objectives of the Foundation are:
  - to increase public awareness of Australia in Korea and of Korea in Australia;
  - To develop partnerships in areas of shared interest
  - To increase their capacity to effectively engage with each other.

  The AKF offers annual grant funding to organisations and individuals to promote projects or activities which encourage Australia’s engagement with Korea. These comprise exchanges, partnerships and other form collaborations that involve R\&D (i.e. in the area of business, education, and academia)\(^71\). Normally the grants awarded are in the range of AUD20, 000-30,000.

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\(^71\) Id.
- **The Korea Australia Emerging Research Leaders Exchange Program**\(^22\)

The Korea Australia Emerging Research Leaders Exchange Program (ERLEP) is a Scheme promoted by the Australian Academy of Technological sciences and engineering with the financial contribution of the AKF, the Department of Foreign Affairs and Trade and the Korean National Research Foundation (NRF). ERLEP is a bilateral international collaboration program that aims to foster individual and institutional R&D linkages between Australia and Korea in the field of S&T. In 2015 six Australian researchers went to Korea; whilst in 2014 six Korean researchers came to Australia.

- **The Discovery Projects (ARC initiative)**

The scheme provides funding for international innovative research projects that can be carried out by individual researchers or by research teams. The main objectives of the program include supporting high profile applied research by individuals and teams, “enhan(ing) international collaboration in research and foster(ing) the international competitiveness of Australian research”\(^73\).

**Table 19** gives an insight on the level of ARC international research collaboration that has been achieved in Australia as of 5 June 2015.

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ARC Projects in Australia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>63</td>
<td>61</td>
<td>61</td>
<td>61</td>
<td>60</td>
</tr>
</tbody>
</table>

**SA-South Korea Relationship**

The bilateral international partnership between SA and South Korea has been cemented by means of several MoUs throughout the years. **Table 20** gives a glimpse of them.

South Korea is South Australia’s 6th largest source country of overseas students and the third largest across Australia. As at August 2013 there were 1,035 students enrolled in South Australia. South Australia’s market share of all South Korean overseas students in Australia is 4.3%. The Korean Study market is set to increase vigorously. The new government has released substantial funds that universities are using to fund short term study abroad projects.

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2013</td>
<td>The Department of International Relations and Trade, Chungcheongnam-do Provincial Government has extended an invitation to South Australia for a South Australian Official to visit their new provincial capital Naepo New City</td>
</tr>
<tr>
<td>7-8 November 2013</td>
<td>His Excellency Mr KIM Bong-hyun, Ambassador of the Republic of Korea made his first official visit to South Australia</td>
</tr>
<tr>
<td>9 December 2001</td>
<td>Signing of the MoU in South Australia between the Provincial Council of Chungcheongnam-do and the Parliament of South Australia by the Hon John Oswald, Speaker of the House of Assembly and Mr KIM Jae-Bong, Chairman of the Provincial Council of Chungcheongnam-do.</td>
</tr>
</tbody>
</table>

\(^22\) [http://www.atse.org.au/content/international/australia-korea-emerging-leaders-program.aspx](http://www.atse.org.au/content/international/australia-korea-emerging-leaders-program.aspx)

\(^73\) Discovery Projects; [http://www.arc.gov.au/ncgp/default.htm](http://www.arc.gov.au/ncgp/default.htm)
May 2000  HE. Governor SIM Dae-Pyung visited South Australia.

23 May 2000  His Excellency Governor SIM Dae-Pyung signed a Memorandum of Understanding (MoU) between the Flinders University of South Australia and the National Kongju Universities of Chungcheongnam-do, South Korea.

12 October 1999  Premier, The Hon John Olsen signed Proclamation of Sister State/Province Cooperation between Chungcheongnam-do, South Korea and South Australia. The agreement included the commitment in bilaterally cooperate in education (practices and exchange), culture and economic growth (investment and exchanges).

11 November 1997  Agreement on the Development of Relations and Exchanges between South Australia and Chungcheongnam-do Provincial Government. The agreement included bilateral international collaborations also through the “exchange of Science and Technology, exchange of information between universities and exchange of professional people between the two people”.

**UniSA Activities**

The collaboration between UniSA and ROK Advanced Institute of Science and Technology (KAIST) was cemented in 1997, by means of the MoU signed amid the Satellite Technology Research Centre (SATREC) and UniSA Institute of Telecommunications Research. International collaboration involved UniSA participation in a microsatellite mission.

Another MoU between UniSA and the Information & Communications University (now part of KAIST) was signed in 2009. KAIST was ranked number 2 in 2014 Asian universities rankings. Finally, UniSA’s Institute of Telecommunications Research has also worked on several projects with the Electronics and Telecommunications Research Institute (ETRI) in Korea.

**Table 21** highlights instances of R&D cooperation between UniSA’s research centre and South Korean Universities and Research Centres.

<table>
<thead>
<tr>
<th>Name of the research Centre</th>
<th>Type of Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gwangju Institute of Science and Technology, Center for Seawater Desalination</td>
<td>Desalination and membrane</td>
</tr>
<tr>
<td>Korean Atomic Energy Research Institute</td>
<td>Waste Water and Pollution Management</td>
</tr>
<tr>
<td>Sunchon National University</td>
<td>Desalination and membrane</td>
</tr>
</tbody>
</table>

**Adelaide University Activities**

Adelaide University has a productive partnership with ROK Institutions in terms of student Mobility Programs; **Table 22** highlights the main opportunities in that sense.

| MOBILITY PROGRAMS BETWEEN UNISA AND ROK INSTITUTIONS                |
|------------------------------------------------------------------|----------------------------------|
| Seoul National University                                        | SNU is a national research university located in Seoul. QS World University Rankings (2014/15) considered it number 31 in the world and number 3 in Asia |
| Yonsei University                                                | YU is a private research university located in Seoul, South Korea. The university was founded in 1885 and it is one of the oldest universities in South Korea. YU is one of the top private schools in ROK. |
| Pusan National University                                        | PNU is a leading university in South Korea ranking among the ten flagship Korean national universities. |
**Flinders University Activities**

Flinders University adheres to the **Australia-Korea Foundation Scholarship Program**. The AKF offers annual funding calls for Grants and Scholarships to support projects or activities which advance Australia's engagement with Korea, including in the field of R&D. The value of individual scholarships ranges from $3,000 to $10,000, but PhD candidates can apply for up to $15,000. From 2014-15 a new category of 'AKF PhD Fellow' (for exceptional PhD candidates) was established. The latter provides two years of funding up to a total of $40,000 for the two years.

**1.8 ASIAN ECONOMIC ENGAGEMENT - CURRENT R&D STATUS IN JAPAN**

Japan achieved one of the world-wide highest economic growth rates between 1960s and 1980s and was the second largest economy from 1968 until 2010, when it was overtaken by China. This was in huge part thanks to Japan’s well-educated and productive work force. This growth was led also by significant investments in R&D. Indeed, Japan has shown a positive attitude towards R&D, ranking second only to South Korea in R&D investments among the G20 Countries in 2011.

**Figure 18** represents Japan position compared to the one of G20 countries in terms of R&D investments.

![Figure 18: R&D Share of GDP in 2011](image)

*Source: National Science Foundation “Science and Engineering Indicators 2014”*

As shown in **Figure 19**, the Japanese International cooperation is lower compared to its high R&D standard. On the Final report from Council of Information and Communications released in June 27, 2014 it was recommended that *International R&D collaboration should be expanded to EU as well as to other countries with larger-scale funding* (Japan’s ICT R&D policies 2014).
**R&D Priorities in Japan**

R&D priorities in Japan were outlined in the 2010 White Paper on Science and Technology. The following list gives an account of them (MEXT 2010).

- energy and environmental sciences, in particular contributing to a low carbon environment
- health and life sciences
- Enhancing basic science and research capability. This includes creating a science and research environment by investing in human resources
- enhancing public understanding and support for science and research
- information and telecommunications
- nanotechnology and materials
- Manufacturing technology.

**1.8.1 AUSTRALIA–JAPAN INTERNATIONAL COOPERATION THROUGH R&D**

The Australia–Japan relationship is crucial to both countries’ strategic and economic interests. It traces back to 1957 Commerce Agreement, when Australia became the first nation to open its doors to trade with Japan after World War II. The Agreement was followed by 1976 Basic Treaty of Friendship and Cooperation and Protocol, which enhanced Australia and Japan international bilateral cooperation.

**AUS-Japan R&D relationship**

In the past decade, Australia-Japan research collaboration has been prolific. Australia-Japan publications have increased greatly, with 1007 articles in 2009. This accounts for 2.5% of Australia’s total publications and 1.3% for Japan. In particular, Medical and health sciences, physical sciences and biological sciences accounted for over 60% of joint publications. Japan’s top national universities are undertaking most of the collaborative research with Australia’s Group of Eight top universities.
CSIRO played an important role in carrying out significant research with Japan. Japan’s top 10 institutions account for 31% of joint publications with Australia and on the other hand Australia’s top 10 institutions account for 63% of joint publications with Japan. Bottom-up researcher-led initiatives are predominant over institution-wide approaches of engagement between the two nations. Australia’s strength in applied science potentially complements Japan’s fundamental science strengths.

In order to further strengthen their economic relationship, on 8 July 2014, Australian Prime Minister Abbott and Japanese Prime Minister Abe formally announced the conclusion of negotiations and the signing of the Japan Australia Economic Partnership Agreement. This has an impact on R&D as well, as a closer economic relationship is very likely to enhance international cooperation.

Financial Tools for Bilateral International Cooperation

- **The Discovery Projects**

  The Discovery Projects are an ARC initiative. The scheme provides funding for international innovative research projects that can be carried out by individual researchers or by research teams. The main objectives of the program include supporting high profile applied research by individuals and teams, “enhanc(ing) international collaboration in research and foster(ing) the international competitiveness of Australian research”.

  Table 23 below gives an insight on the level of ARC international research collaboration that has been achieved both in Australia and in South Australia as of 5 June 2015.

<table>
<thead>
<tr>
<th>Table 23</th>
<th>INTERNATIONAL COLLABORATION ON ARC-FUNDED RESEARCH PROJECTS WITH JAPAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All ARC Projects in Australia</td>
</tr>
<tr>
<td>14%</td>
<td>4,8%</td>
</tr>
</tbody>
</table>

- **The Japan Foundation**

  The Japan Foundation is a semi-governmental organisation that promotes Japanese studies and cultural exchange at an international level. It is worth mentioning that a UniSA fellowship at Waseda University was promoted and supported by a Japanese Studies and Intellectual Exchange grant provided by the Foundation at issue.

- **The Mawson Lakes Fellowship Program**

  The Mawson Lakes Fellowship Program (MLFP) provides scholarships to assist early career researchers and Australian and Japanese students undertaking honours, masters or doctoral studies by coursework or research. Adelaide University and Flinders University in South Australia are involved in the MLFP by means of their partnerships and activities with key Japanese Institutions.

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74 http://www.arc.gov.au/ncgp/default.htm
SA-Japan Relationship

SA-Japan bilateral relations have flourished in the past few years. This relationship has often taken the form of the establishment of sister-State connections. For instance, SA has a Sister-State relationship with Okayama Prefecture. The latter encourages mutual exchanges in education and culture. In particular, Adelaide has a sister-city relationship with Himeji, which was established in 1982 to deepen mutual understanding through educational programs, cultural and social exchanges.

The relationship between SA and Japan has been cemented by several other activities that have taken place throughout time. In particular, The Deputy Consul-General to Japan visited Adelaide in May 2015. And the Manager and Assistant Manager of the International Affairs Division of the Okayama Government visited SA in February 2015. These relations and activities are a prolific hub to encourage international cooperation in R&D.

Also, it is worth mentioning Okayama Prefecture student delegation visited SA as part of the anniversary Sister-State celebrations in August 2013, whereas in November 2012 the Mayor of Himeji visited SA to celebrate the anniversary of the sister city relationship between the city of Himeji and Adelaide.

The bilateral international partnership between SA and Japan has been sealed by means of several MoUs throughout the years. Table 24 gives a glimpse of them.

<table>
<thead>
<tr>
<th>Name of the initiative/Agreement</th>
<th>Brief Description</th>
<th>Current Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Okayama Prefectural Board of Education, Japan</td>
<td>Its intent - to formalise the collaborative work and reciprocal commitment to maintain the continuance of the teaching of the language of the respective countries in South Australian Government schools. Teacher exchange – DECS send one SA teacher each year to teach English to students and adults.</td>
<td>ACTIVE Signed in 1998</td>
</tr>
<tr>
<td>Himeji City Board of Education, Japan</td>
<td>Its intent - to formalise the collaborative work and reciprocal commitment to maintain the continuance of the teaching of the language of the respective countries in South Australian Government schools.</td>
<td>ACTIVE</td>
</tr>
</tbody>
</table>

Exchange & Research agreements between SA Universities and JPN Universities

Japan is South Australia’s 11th largest source country of overseas students (February 2015) and Japanese is widely studied by Australians students. South Australia’s market share of all Japanese overseas students in Australia is 4.09% increasing from 2013.

The following SA Government Schools have sister school relationships with Okayama Prefecture:
- Clare High School and Clare Primary School, and Yoshinaga Junior High School
- Golden Grove High School and Seto Junior High School
- Keithcot Farm Primary School and Asahi Juku Primary School
- Kiethcot Farm Primary School and Okayama School of English
- Willunga High School and Akasaka Junior High School

Also, SA Government Schools currently have an active Teacher Exchange Program Agreement which was signed in 1988 between the Okayama Prefectural Board of Education and the Department of Education and Children’s Services.
UniSA Activities

UniSA has had a long history of research interaction with Japan. **Table 25** gives an account of UniSA partnerships with Japanese institutions.

<table>
<thead>
<tr>
<th>Table 25</th>
<th>UNISA PARTNERSHIPS WITH JAPANESE INSTITUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Keio University</strong></td>
<td>UniSA’s Hawke Research Institute (HRI) collaborates with Keio University through joint seminars and joint research with a goal of dual PhDs. Keio University is considered the 'Harvard' of Japan and the current Memorandum of Understanding facilitates research collaboration.</td>
</tr>
<tr>
<td><strong>Waseda University</strong></td>
<td>Waseda University is a partner under the MLFP</td>
</tr>
<tr>
<td><strong>University of Tokyo</strong></td>
<td>Research collaboration between UniSA’s flagship Ian Wark Research Institute and the University of Tokyo’s Graduate School of Engineering is the source of a long standing research relationship. Such research contributed towards UniSA being ranked in the top 100 for engineering in the Times Higher Education 2013-2014 rankings.</td>
</tr>
<tr>
<td><strong>Nagoya University</strong></td>
<td>Nagoya University is a student exchange partner. UniSA’s success under the New Colombo Plan in 2014 will assist our students to continue to exchange there for a full semester of study. Additionally, Nagoya University is also a partner under the MLFP, which has resulted in graduate student exchange.</td>
</tr>
<tr>
<td><strong>Kwansai Gakuin University (KGU)</strong></td>
<td>Exchange program for undergraduate students for a semester of study.</td>
</tr>
<tr>
<td><strong>Okayama University</strong></td>
<td>Okayama University is a longstanding exchange partner.</td>
</tr>
<tr>
<td><strong>Mobara City</strong></td>
<td>Through a sister city relationship, the City of Salisbury, SA and Mobara City, Chiba, UniSA has placed interns in Japan Display Inc (JDI) for extended stays under the auspices of Fujiwork. The student interns are widely exposed to research and innovation processes.</td>
</tr>
</tbody>
</table>

Adelaide University Activities

**Table 26** gives an account of Adelaide University partnership with Japanese institutions.

<table>
<thead>
<tr>
<th>Table 26</th>
<th>MOBILITY PROGRAMS BETWEEN ADELAIDE UNIVERSITY AND JAPANESE INSTITUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>University of Tokyo</strong></td>
<td>Research university located in the Capital.</td>
</tr>
<tr>
<td><strong>Nagoya University</strong></td>
<td>Japanese national university that ranks amongst the 7 best Japanese Universities.</td>
</tr>
<tr>
<td><strong>Osaka University</strong></td>
<td>National university, it is the sixth oldest university in Japan and one of Japan’s National Seven Universities.</td>
</tr>
<tr>
<td><strong>Sophia University</strong></td>
<td>Private research university.</td>
</tr>
<tr>
<td><strong>Other partnerships with:</strong></td>
<td>Chuo University; Kansai University; Okayama University</td>
</tr>
</tbody>
</table>

Flinders University Activities

**Table 27** gives an account of Flinders University partnership with Japanese institutions.

<table>
<thead>
<tr>
<th>Table 27</th>
<th>MOBILITY PROGRAMS BETWEEN FLINDERS UNIVERSITY AND JAPANESE INSTITUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nagoya University</strong></td>
<td>Japanese national university that ranks amongst the 7 best Japanese Universities.</td>
</tr>
<tr>
<td><strong>Waseda University</strong></td>
<td>Waseda University is a partner under the MLFP</td>
</tr>
<tr>
<td><strong>Other partnerships with:</strong></td>
<td>Chuo University; Hiroshima University; Yokohama National University</td>
</tr>
</tbody>
</table>
Due to its limited territorial dimensions and to the absence of natural resources, Singapore has successfully aimed to be competitive by making the most of its significant skilled human capital, greatly promoting R&D as the main engine for economic growth and development. In fact, the Government has aimed to turn Singapore into an international hub for R&D in the South East Asian Region. This is a winning strategy, as Singapore extends on a surface of just over 700 sq. km, but has an overall population of 5.5 million people (as of end-June 2014) that can greatly contribute for the Nation’s development and growth.

The Government has pursued strategies in order to achieve this ambitious goal. In 2004, it established a Ministerial Committee on Research and Development (MCRD) - chaired by the Prime Minister. As part of the work the MCRD visited small but economically advanced realities all around the world to better understand and imitate the way they could successfully use R&D as a way to pursue economic growth despite their size limitation (i.e. Switzerland, Denmark etc.).

A$16.1 billion were invested by the Singapore Government over 2011-2015 to further boost research, innovation and enterprise, aiming to grow Gross Expenditure on R&D to 3.5% of GDP by the end of 2015 through increased private sector R&D expenditure75. As a result, Singaporean companies increased their investments in research and development activities by 16 per cent or nearly A$180 million from A$1.1 billion in 2011 to A$1.3 billion in 201276. This fully reflects the country’s R&D strategy to be a research-based, innovative and entrepreneurial growing economy.

As of today, the R&D sector also continues to provide and create high-value jobs in Singapore, as the number of R&D jobs peaked to a new high of 39,077 in 2012. This number comprises Research Scientists and Engineers (RSEs), non-degree researchers and other supporting staff, although in recent years the trend is a yearly increase in the number of highly skilled RSEs (PhDs or Masters RSEs) employed in the sector.

Figure 20 shows the growth of the total R&D manpower between 1990 and 2012. The significant growth in numbers of researchers and the improvement in their skills prove the importance attributed to the R&D sector by Singapore Government.

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75 Currency conversion as of 30/07/2015 : A$1 = S$1
76 National Survey on Research and Development 2012
Singaporean Government has set a growth target of 3-5% p.a. over the period 2010-2020 and plans to keep pursuing a model driven by innovation and productivity.

**Figure 21** shows the gross business expenditure (BERD) and public expenditure (GOVERD, here referred as PUBERD) on R&D, as a GDP percentage (1990-2012). Over the past decade, PUBERD has increased, reaching A$2.8 billion in 2012 (0.8% of Singapore’s GDP). Similarly, BERD reached A$4.4 billion (1.3% of GDP).

**Figure 21: Gross Expenditure on R&D, GDP Percentage (1990-2012)**

![Figure 21: Gross Expenditure on R&D, GDP Percentage (1990-2012)](source)

*Source: A Star National survey published in December 2013*

**Figure 22** shows the Gross Expenditure on R&D and the related GDP growth percentage from 1990-2012.

**Figure 22: Gross Expenditure on R&D and GDP Growth Percentage (1990-2012)**

![Figure 22: Gross Expenditure on R&D and GDP Growth Percentage (1990-2012)](source)

*Source: A Star National survey published in December 2013*
R&D Priorities in Singapore

The Singaporean government has identified five strategic priority areas in R&D promotion. Those are:

- Environmental and Water Technologies (Clean Water and Clean Energy)
- Biomedical Sciences Translational and Clinical Research
- Electronics, Interactive and Digital Media
- Chemicals, oil and gas service and Technology
- Food industry

Singapore is one of the most important financial centres worldwide, in particular because it is one of the world’s top three oil-refining centres, the world’s largest oil-rig producer, and a major hub for ship repair services. It is also worth mentioning Singapore is a well-established market for Australian food and beverage products. These represent some further key areas for R&D.

1.9.1 SINGAPORE – AUSTRALIA INTERNATIONAL COOPERATION THROUGH R&D

The bilateral international partnership between SA and Singapore is based on links tracing back to Commonwealth, trade, defense, education and tourism. In 2015, the 50th anniversary of Australia-Singapore diplomatic relations is celebrated, and the two countries are working towards a Comprehensive Strategic Partnership (CSP) to further improve their bilateral relationship of collaboration. In particular, the two countries are looking to increase their defence and economic international cooperation. On 29 June 2015, Prime Minister Tony Abbott and Singapore's Prime Minister, Lee Hsien Loong, announced the signing of the partnership at a conference in Singapore.

AU-Singapore R&D relationship

Dr Bronwyn Evans, Chief Executive Officer of Standards Australia, said “Singapore is a strategic trade and investment partner for Australia”. This target encompasses R&D as well.

On 22 August 2014, the eighth Singapore-Australia Joint Ministerial Committee (SAJMC) was held in Singapore, and led to the roadmap and partnership - Project 2025. The SAJMC is a committee led by foreign ministers and attended by ministers responsible for other areas of bilateral cooperation. SAJMC meetings have been repeatedly held in Singapore and Australia since 1996. Project 2020 is an ambitious Scheme of practical cooperation in the most diverse areas which underpins Singapore and Australian present and future cooperation. The collaboration intended is across the Economic, Foreign Affairs, Defense/Security and People-to-People fields.

On 29 June 2015, Australia and Singapore signed an historical MoU to expand bilateral international cooperation. The MoU was signed between Standards Australia and SPRING Singapore to align standards and boost cooperation opportunities. The expanded cooperation is in light of the CSP between Australia and Singapore. The MoU established a formal framework to strengthen, promote

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78 Standards Australia is the nation's peak non-government Standards organisation. It is charged by the Commonwealth Government to meet Australia’s need for contemporary, internationally aligned Standards and related services; [http://www.standards.org.au/OurOrganisation/AboutUs/Pages/default.aspx](http://www.standards.org.au/OurOrganisation/AboutUs/Pages/default.aspx)
79 SPRING Singapore is an agency under the Ministry of Trade and Industry responsible for helping Singapore enterprises grow and building trust in Singapore products and services [http://www.spring.gov.sg/About-Us/Pages/spring-singapore.aspx](http://www.spring.gov.sg/About-Us/Pages/spring-singapore.aspx)
and develop cooperation on harmonization of priority sectors (with an initial focus on the building and construction and functional food sectors) and related activities between the two Nations.

Australia has also a strong education and training relationship with Singapore. Over 100,000 Singaporeans have studied in Australia and in 2014 and 2015 Singapore participated in the New Colombo Plan (NCP). The NCP is an initiative of the Australian Government which aims to enhance the international cooperation – included in the field of R&D – between Australia and Singapore (amongst others) through a series of studies and internships bilateral programs.

Financial Tools for Bilateral International Cooperation

The enhanced cooperation between Australia and Singapore can be achieved by means of financial instruments such as The Discovery Projects (ARC initiative). The scheme provides funding for international innovative research projects that can be carried out by individual researchers or by research teams. The main objectives of the program include supporting high profile applied research by individuals and teams, “enhanc[ing] international collaboration in research and foster[ing] the international competitiveness of Australian research”80.

Table 28 below gives an insight on the level of ARC international research collaboration that has been achieved both in Australia and in South Australia as of 5 June 2015.

<table>
<thead>
<tr>
<th>Table 28</th>
<th>INTERNATIONAL COLLABORATION ON ARC-FUNDED RESEARCH PROJECTS WITH SINGAPORE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All ARC Projects in Australia</td>
</tr>
<tr>
<td></td>
<td>2011</td>
</tr>
<tr>
<td>115</td>
<td>117</td>
</tr>
<tr>
<td>ARC Projects Administered By South Australian Institutions And percentage of the total</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>6,1%</td>
<td>7,7%</td>
</tr>
</tbody>
</table>

SA-Singapore Relations

During the 2014 State election, the Government made a commitment to implement an engagement strategy for South East Asia, which was finalized in March 2015. Singapore has a key role in the Strategy, as extensive opportunities exist to broaden and deepen SA relationship with the City State, due to its highly open economy.

Singapore is ranked in the top 15 of the world’s richest countries on a per capita basis and it is Asia’s headquarters for many multinationals. Singapore has invested heavily in R&D and has been very active in encouraging start-ups and the settling down of global business.

Exchange & Research agreements between SA Universities and SGP Universities

With 519 Singaporeans studying in South Australia (2013), Singapore ranks number 8 in the overall SA international student market. South Australia’s share of all Singaporean students enrolled in Australia is 5.9 % (SA share of all international students is 5.4%).

Singapore is well-known for setting an example for cooperation between educational institutions, the government and the private sector. This offers opportunities for South Australia to collaborate in R&D and policy development in a number of fields, including the biomedical which has been boosted

80 http://www.arc.gov.au/ncgp/default.htm
by the recent opening of Adelaide’s South Australian Health and Medical Research Institute (SAHMRI). This is greatly achieved by partnerships in education. A brief account of them will follow.

**UniSA Activities**

Table 29 gives a brief account of the initiatives currently available between UniSA and Singaporean Institutions.

<table>
<thead>
<tr>
<th><strong>Table 29</strong></th>
<th>PROGRAMS AND INITIATIVES BETWEEN UNISA AND SINGAPORE INSTITUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Singapore Alumni Chapter</strong></td>
<td>Through Singapore Alumni Chapter, UniSA keeps graduates connected to the networks and resources of the University and offers graduates living in Singapore access to a range of activities for professional, personal and career development. The Chapter serves as a platform for local alumni to network and create opportunities for international cooperation.</td>
</tr>
<tr>
<td><strong>M2 Academy in Singapore</strong></td>
<td>M2 Academy in Singapore is a program that has been designed in partnership with relevant industries and professions. UniSA and M2’s learning approach focuses on industry connection through internships, mentoring and placements that provides students with an international mindset and gives them a great network opportunity to engage in future research collaboration. The new degree programs were launched at a purpose-built campus in Singapore (The new Singapore Orchard Gateway Campus).</td>
</tr>
</tbody>
</table>

**Adelaide University Activities**

The University of Adelaide engages broadly across South East Asia. It has a joint-venture education institution in Singapore and a range of study tour visits in – amongst other regions of South East Asia - Singapore. Significant R&D collaboration projects are led by the University at issue. It is worth mentioning that SA and Singapore have strong education and alumni links with many high profile people who studied in Adelaide, including the current President Dr. Tony Tan Kang Yam and Mr Kay Iswaran (Minister of State for Trade and Industry), both former Adelaide University students.

<table>
<thead>
<tr>
<th><strong>Table 30</strong></th>
<th>MOBILITY PROGRAMS BETWEEN ADELAIDE UNIVERSITY AND SINGAPOREAN INSTITUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National University of Singapore (NUS)</strong></td>
<td>The National University of Singapore (NUS) is a leading research university in Singapore. The institution gives great importance to adopt a global approach to education and research.</td>
</tr>
<tr>
<td><strong>Singapore Management University</strong></td>
<td>The Singapore Management University is an autonomous government-funded university.</td>
</tr>
</tbody>
</table>

**Flinders University Activities**

Table 31 gives a brief account of the initiatives currently available between Flinders University and Singaporean Institutions.

<table>
<thead>
<tr>
<th><strong>Table 31</strong></th>
<th>MOBILITY PROGRAMS BETWEEN FLINDES UNIVERSITY AND SINGAPOREAN INSTITUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nanyang Technological University</strong></td>
<td>Several Mobility programs in the fields of Business, Engineering, Arts &amp; Humanities, Social Science, and Science.</td>
</tr>
</tbody>
</table>
1.10 ASIAN ECONOMIC ENGAGEMENT - CURRENT R&D STATUS IN CHINA

In recent decades, China has made important achievement in the R&D, becoming a leading investor in the sector. In fact, China is marching towards becoming a regional technological superpower (Sigurdson 2005).

In 2006 China’s State Council published a strategy document to guide the country’s R&D for the upcoming years. The goal is to make China an innovation-oriented society by the year 2020 and a world leading innovator in the longer term (State Council 2006). The strategy was confirmed by means of China’s Five-Year Programme (FYP) 2011-2015 that aims to turn China into a R&D hub.

China’s investment in R&D has been substantial in the past decade. In 2010 China was ranked number two investor in R&D (after the US) with a total spending of US$178 billion. Moreover, China has the largest R&D research team with a total of about 2.9 million full time equivalent (FTE) researchers in 2011 (Trends and Prospects in China’s R&D Sector 2012). Figure 23 below gives an account of the R&D intensity and GDP per capita in selected economies, meanwhile highlighting the expected Chinese R&D intensity growth.

![Figure 23: R&D Intensity and GDP per Capita in Selected Economies and Expected Chinese R&D Intensity Growth.](image)


Figure 24 shows how the expenditure in R&D as referred to the overall GDP has risen from 0.90% in 2000 to 1.83% in 2011. According to China’s 12th FYP, the country’s R&D intensity is to reach 2.20% in 2015 and 2.50% in 2020. The current growth trend is promising in that sense (Trends and Prospects in China’s R&D Sector 2012).

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81 Currency conversion as of 30/07/2015: US$1 = A$1.37
The Chinese effort in R&D has had an impact on its innovation trend. Suffice is to say that the number of invention patents awarded in China rose from 57,786 to 172,000 during the period 2006-2011 (Trends And Prospects in China’s R&D Sector 2012). Moreover, it is worth mentioning there are about 11.4 million undergraduate students and 0.8 million postgraduate students who are involved in scientific study-fields and about 285,000 Chinese students are studying overseas. These students will potentially add to the pool of R&D researchers and enhance international cooperation in R&D.

**R&D Priorities in China**

R&D priority sectors accounted for about 78.9% of total R&D spending within all sectors in 2010. R&D priorities sectors in China are:

- Computers, communication and clean-tech
- Pharmaceuticals
- Chemicals
- Advanced Manufacture
- Metals and Coal mining

As shown above, the top sectors refer to high-tech industries, such as pharmaceuticals, medical equipment, computer, electronic and communication equipment and aerospace.

**1.10.1 AUSTRALIA - CHINA INTERNATIONAL COOPERATION THROUGH R&D**

The international cooperation between Australia and China has been significant, also as a result of the activity of the Australia-China Council (ACC), which promotes engagement between China and Australia in education, science, business and culture in a “people to people” type of linkage. Moreover, Australia and China have a great range of common interests, with increasing collaboration in international cooperation in R&D.

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82 This number is reported in NBS (various years). It may include government-sponsored students only. In reality, there may be more than one million Chinese students studying overseas.
AU-China R&D relationship

China is SA second largest source of visitor arrivals with 759,691 arrivals in 2013-14. Australia is one of the most popular destinations for Chinese students wishing to study overseas. Indeed, China is Australia’s largest source of overseas students with over 148,244 students in May 2014. China agreed to be involved in the New Colombo Plan from 2015 (see table below). Australia-China engagement in education, science, business and culture is greatly promoted by the ACC.

A dialogue was established between China and Australia, during Prime Minister Abbott’s visit to China in April 2014. The Dialogue aims to enhance mutual understanding between Australia and China by bringing together senior Australian and Chinese government representatives and business, academia, and social leaders to discuss and debate key issues. This will have an impact on R&D policies too. The inaugural Dialogue was held from 3 to 4 December 2014. Table 32 shows the most relevant MoUs and Agreements that have been signed between Australia and China in order to promote international cooperation between the two nations.

<table>
<thead>
<tr>
<th>Table 32</th>
<th>MoUs AND AGREEMENTS SIGNED TO PROMOTE AUS-CHN INTERNATIONAL COOPERATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Colombo Plan</td>
<td>The NCP encourages a two-way flow of students between China and Australia. The initiative will help to lift knowledge of China in Australia and strengthen people-to-people and institutional relationships, through a network of study and internships international programs.</td>
</tr>
<tr>
<td>the Australia-China High-Level Dialogue</td>
<td>Established during Prime Minister Abbott’s visit to China, between him and Chinese Premier Li Keqiang. The Dialogue aims to enhance mutual understanding between Australia and China.</td>
</tr>
<tr>
<td>Australia-China Council’s Strategic Plan 2014-18</td>
<td>The mission of the ACCSP is to encourage innovation in the two countries whilst “Strengthening foundations and developing new frontiers of Australia-China partnership”.</td>
</tr>
</tbody>
</table>

Financial Tools for Bilateral International Cooperation

- **The Discovery Projects**

The Discovery Projects are an ARC initiative. The scheme provides funding for international innovative research projects that can be carried out by individual researchers or by research teams. The main objectives of the program include supporting high profile applied research by individuals and teams, “enhanc(ing) international collaboration in research and foster(ing) the international competitiveness of Australian research”[^84].

Table 33 below gives an insight on the level of ARC international research collaboration that has been achieved both in Australia and in SA as of 5 June 2015.

[^84]: http://www.arc.gov.au/ncgp/default.htm
ACC GRANTS

ACC’s mission is to strengthen international cooperative relations between Australia and China. Each year, ACC delivers around A$700,000 in grants for organisations and individuals to pursue its goals. The grants sponsor innovative proposals relevant to the objectives of the ACC Strategic Plan 2014-18. There is one grant round each year, opening in February (the last one opened in February 2015)85.

SA-China R&D Relationship

SA-China bilateral relations have flourished in the past few years. In July 2014 the South Australia-China Engagement Strategy was launched in collaboration with the Australia China Business Council (ACBC) to enhance international cooperation between China and SA, also in the field of R&D. Nonetheless, their collaboration traces back to 1986 when a partnership between SA and the Shandong Province of China was established. Currently, the two entities are in a sister-state relationship.

The bilateral international partnership between SA and China has been sealed by means of several MoUs throughout the years. Table 34 shows the most relevant recent MoUs that have been signed between South Australia and China that have an impact on R&D.

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**Table 33**

INTERNATIONAL COLLABORATION ON ARC-FUNDED RESEARCH PROJECTS WITH CHINA

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ARC Projects in Australia</td>
<td>376</td>
<td>385</td>
<td>398</td>
<td>394</td>
<td>373</td>
</tr>
<tr>
<td>ARC Projects Administered By South Australian Institutions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>And percentage of the total</td>
<td>18</td>
<td>19</td>
<td>22</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>4,8%</td>
<td>5%</td>
<td>5,5%</td>
<td>7,1%</td>
<td>7,5%</td>
</tr>
</tbody>
</table>

---

**Table 34**

FINAL COOPERATION PROJECTS SIGNED IN CHINA IN MAY 2015

<table>
<thead>
<tr>
<th>Project name</th>
<th>Project Proponent</th>
<th>Description</th>
</tr>
</thead>
</table>
| MoU: China-Australia Joint Innovation Centre for Cell Therapy. | • University of South Australia;  
• Shandong University. | MoU signing between UniSA and Shandong University with intent to undertake cooperative activities to their mutual benefits and begin process of creating a new China Australia Joint Innovation Centre for Cell Therapy. The research centre is an industry focused initiative designed to give access to the China Market for cell therapies developed at UniSA. |
| MoU: Department of Primary Industries and Regions (South Australia) (PIRSA) and Shandong | • PIRSA;  
• Shandong Provincial Department of Oceanic and Fisheries (SOFD). | To promote trade and investment opportunities, share information and to increase research and technical exchanges and collaboration through |

---

<table>
<thead>
<tr>
<th>Collaboration/ Agreement</th>
<th>Institutions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative Degree Program Agreement: Joint Masters Program in Pharmaceutical Sciences (UniSA and Shandong University).</td>
<td>University of South Australia; Shandong University.</td>
<td>The China Australia Centre for Health Sciences Research, launched during the Premier’s visit in 2013 (and conceived during his visit in 2012) has now developed a collaborative Master’s program to be delivered partly in Jinan and partly in Adelaide.</td>
</tr>
<tr>
<td>MoU: Earth Sciences Cooperation in Geoscience.</td>
<td>Shandong Provincial Bureau of Geology and Mineral Resources, Peoples Republic of China (SDGM); Geological Survey of SA (GSSA – DSD).</td>
<td>MoU with objective to enhance communication and cooperation in geosciences, SDGM and GSSA will aim to: improve knowledge on geoscience mapping, mineral exploration models and exploration technology; communication on exploration technology and to jointly cultivate talents by knowledge exchange.</td>
</tr>
<tr>
<td>MoU: Four-way Academic Collaboration in Tourism Management.</td>
<td>Shandong Tourism Administration; Shandong University School of Management; SA Tourism Commission; University of South Australia Business School.</td>
<td>To further exchanges and collaborations in tourism between the two provinces to explore high level regular and innovative work mechanisms, to collaborate and exchange activities.</td>
</tr>
<tr>
<td>MoU: TAFE SA and Shandong Vocational Animal Science and Veterinary College.</td>
<td>TAFE SA; Shandong Vocational Animal Science and Veterinary College.</td>
<td>To facilitate research cooperation, the exchange of staff and students and other forms of educational cooperation between the two institutions.</td>
</tr>
<tr>
<td>Heads of Agreement: China-Australia Institutes for Marine Biotechnology Industry (CAIMBI) – Flinders – CSIRO – Qingdao Institute (FCQI)</td>
<td>Flinders University of South Australia (FUSA); Commonwealth Scientific and Industrial Research Organisation (CSIRO) Qingdao National High-Tech Industrial Development Zone.</td>
<td>To encourage the development of the proposed Flinders – CSIRO – Qingdao Institute (FCQI) as the inaugural initiative of the China – Australia Institutes for Marine Biotechnology Industry (CAIMBI) network. The FCQI would consist of two campuses, located in Qingdao and South Australia.</td>
</tr>
<tr>
<td>MoU: TAFE SA and Qingdao No. 6 High School</td>
<td>TAFE SA; Qingdao No. 6 High School</td>
<td>To strengthen international communication around higher education, establishment of school exchanges and promote the friendship of young people including to: 1. Determine the merits of</td>
</tr>
</tbody>
</table>
| MoU: Australian Chinese International Medical Group and Affiliate Hospital of Qingdao University. | Establishing a curricular Articulation Agreement between parties.  
2. (For QD6HS) to promote students to further study in TAFE SA.  
3. Define opportunities for collaboration to benefit students’ participation in college-level art and design curricular.  
4. Define opportunities for faculty and students which will enhance the curricular experiences for students. | To promote mutually-beneficial cooperation in the health sector. |
| --- | --- | --- |
| MoU:  
PKU College and Hessel Group | • Hessel Group  
• PKU College - Beijing | The Hessel Group (a South Australian Training Provider) will deliver training to the PKU College (a leading Childcare Provider in Beijing) for teachers and principals. |
| Representation Agreement between Shanghai Small and Medium Enterprise Centre for International Cooperation (SMEC) & Regional Development Australia (RDA) Adelaide Hills, Fleurieu and Kangaroo Island. | • Regional Development Australia (RDA) Adelaide Hills, Fleurieu and Kangaroo Island Inc;  
• Shanghai Small and Medium Enterprise Centre for International Cooperation (SMEC). | This representation agreement is a contract with the intent for the SMEC to provide professional services to the RDA regions. A key aim will be to attract and introduce inward investment projects and venture capital to the RDA regions. The agreement stems from a Regions SA funded project to develop a portfolio of investment opportunities. The initial MoU was signed in Adelaide. |
| Balco Investment. | • Balco;  
• Shanghai; Yanhua Biotech | Balco has received significant capital injection from Shanghai Yanhua Group, an upgrade of the eight year trade relationship. |
| MoU:  
RT-Mart;  
Business SA and Famous Australian Brands | • RT Mart;  
• Business SA  
• Famous Australian Brands. | To formalise the parties collaborative work and reciprocal commitment to strengthen the Australian brands influence and increase the sales of South Australian products in RT-Mart. |
| MoU:  
Unimedia – Promoting SA throughout China | • Unimedia;  
• Australia China Development Company. | MoU between Unimedia and Australia China Development Company to formalise their collaborative work to increase the penetration of the SA Brand in China. |
Exchange & Research agreements between SA Universities and CHN Universities

Being a fast developing country, China needs the same speed of growth for the sophistication of its students’ skills. In the last few years, the Chinese government spent billions of Yuan, at least 1.5% of its GDP, on higher education with the aim of propelling its best institutions, such as the universities of Tsinghua, Peking and Shanghai Jiao Tong University that rank as of the top higher learning institutions in China.

Students from China comprised more than 40 per cent of the overall number of international students who came in South Australia last year. There are around 11,119 Chinese students enrolled in SA institutions, representing 7.5% of the total market share (as to May 2014). The high number of Chinese students in Australia has led to strong links between Australian and Chinese institutions. Australia now has more links with Chinese institutions than with any other nationality (Meng, Cerini 2014). There are 146 offshore programmes offered in China by Australian institutions and their Chinese partners (Evans, 2012). These links help promoting the cooperation on joint R&D programmes.

**UniSA Activities**

UniSA has had a long history of research interaction with China. **Table 35** gives an account of UniSA partnership with Chinese institutions.

<table>
<thead>
<tr>
<th>Table 35</th>
<th>UNISA PARTNERSHIP AND INITIATIVES WITH CHINESE INSTITUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>China-Australia Centre for Health Science Research</strong></td>
<td>The China-Australia Centre for Health Science Research (CACHSR) is an international comprehensive collaborative research centre established between Shandong University in China and University of South Australia in Australia. The centre undertakes research in pharmaceutical sciences, medicine, and public and population health, as well as other scientific fields which relate to health issues, including advanced materials, nanoparticle interface science and cell therapy. The aim of this work is ultimately to provide suggestion to policy-makers in China and Australia which will help to address health problems.</td>
</tr>
<tr>
<td><strong>Adelaide-China research partnership with Third Military Medical University in Chongqing</strong></td>
<td>It is a Chinese military institution of higher learning. In April 2015, Scientists from the University of South Australia along with colleagues from Third Military Medical University in Chongqing discovered the drug Edaravone, which alleviates the progressive cognitive deficits of Alzheimer’s Disease, a major social and economic burden worldwide.</td>
</tr>
</tbody>
</table>

**Other partnerships with:**
- Beijing Normal University
- Shandong University
- Tianjin University
- Beijing Jiaotong University
Adelaide University Activities

Table 36 gives an account of Adelaide University partnership with Chinese institutions.

<table>
<thead>
<tr>
<th>MOBILITY PROGRAMS AND INITIATIVES BETWEEN ADELAIDE UNIVERSITY AND CHINESE INSTITUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>China Scholarship Council University of Adelaide Joint Postgraduate Scholarships Program</strong></td>
</tr>
<tr>
<td><strong>China-Australia Sustainable Research Unit</strong></td>
</tr>
</tbody>
</table>

Other partnerships with:
- Beijing Foreign Studies University
- Fudan University
- Peking University Law School
- Shandong University
- Shanghai Jiao Tong University
- Tsinghua University
- University of International Business and Economics

Flinders University Activities

Table 37 gives an account of Flinders University partnership with Chinese institutions.

<table>
<thead>
<tr>
<th>MOBILITY PROGRAMS, INITIATIVES AND PARTNERSHIPS BETWEEN FLINDERS UNIVERSITY AND CHINESE INSTITUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Institution</strong></td>
</tr>
<tr>
<td>Chinese corporation Qingdao Gather Great Ocean Group and Flinders University</td>
</tr>
<tr>
<td>Hongshu District (Hangzhou) Health Dept.</td>
</tr>
<tr>
<td>Central South University</td>
</tr>
<tr>
<td>Hunan University</td>
</tr>
<tr>
<td>Wenzhou Medical College, Zhejiang</td>
</tr>
<tr>
<td>Beijing Normal University</td>
</tr>
</tbody>
</table>
CHAPTER 2

TALENT ATTRACTION AS A BEST PRACTICE IN R&D

“The real in international relations includes not only the state of affairs at the moment of time, but the direction of change as time proceeds.”

—Timothy Snyder, the Reconstruction of Nations (Yale University Press, 2003)

The analysis of the ‘best practices’ in R&D that have been implemented around the world is of great help to point at effective strategies that Australia and South Australia could adapt to their own reality. The analysis that will follow will focus on model case studies of successfully employed best practices around the world, through the adoption of an approach mainly focused on international cooperation in R&D.

Human capital has proven itself to be crucial in boosting international R&D and innovation. The strategy of talent-attraction aims to bring highly skilled and qualified emigrants back to their own country in order to help it grow using its precious human resources. The idea behind this approach is to encourage the phenomenon of “brain circulation” as opposed to the one of “brain draining”. The theory that backs up this strategy is that talented people seek out chances to grow and they would be keen to collaborate with organisations that provide good opportunities to do so. This is likely to generate a virtuous cycle as, if people are developing themselves faster and better than they could anywhere else, then why would they leave? Another positive side effect of this – other than attracting and retaining gifted researchers – is that talent creates more overall opportunities to foster innovation and fuel growth as it acts like a magnet for more talent according to the formula “talent attracts talent” (Talent Magnetism 2013).

In recent years, several countries and in particular Asian ones seem to have been willing to embrace this type of strategy, leaning towards a ‘Brain Reclaim’ strategy. Indeed, for a long time Asia has been a source of talents to Western Counties, with many graduates and researchers of Asian origin migrating for good as academics and scientists. As Asia’s economies boom and its higher education and research sector expands, the stream of talent has now been triggered to go in the opposite direction. As Tony Chan - President of Hong Kong University of Science and Technology - pointed out “The rise of Asian economies is affecting the direction of the student flow” also because “Asian governments are pumping more money into education.” To this reverse trend certainly contributes the fact that wild cutbacks are being made in Western Countries.

Adopting a policy of talent-attraction has been a winning card for China and India, who implemented this plan by mean of two leading international Schemes. On more general terms, the figure below shows the overall possible effects of highly skilled international migration.

2.1 CHINA: THE THOUSAND TALENTS PROGRAM CASE STUDY

With the escalation of China as a world power, Governments, private companies, universities and research centres have become increasingly aware of the crucial importance of retaining and attracting local talents.

In the 1990s, one of the first initiatives undertaken by the Government was to encourage people to return back for short periods in order to show to overseas high-skilled researchers and scholars how China was positively changing and progressing. In 1992, Shanghai announced some policies encouraging the return of overseas Chinese. Another instance is the establishment of China's first high-tech park for overseas Chinese in Nanjing - the capital city of Jiangsu Province- in 1994 for the employment of talents coming from overseas.

This is the background that triggered China to implement the Thousand Talents scheme, a reverse brain drain action that attracted prestigious names by offering high grants, state-of-the-art laboratories and various other incentives (such as assistance with housing and tax-free education allowances for the children of such returnees). The Thousand Talents policy was launched in December 2008 by the Central Organisation Department (COD), with the goal to attract back to China 2,000 talents of any nationality by 2018. The Thousand Talents scheme was supposed to run to 2018. As the quotas have already been fulfilled, it is not clear whether the Scheme will be renewed until 2018.

The Government recognised that the best way to improve science and technology in China was to create a domestic environment that could entice the talents who went abroad to return back. The Government aimed not only at Chinese people, but also at international highly skilled researchers and scholars. The method to implement the strategy in China varied from Region to Region and even from City to City. For instance, some cities adopted preferential policies, such as subsidised home

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88 One thousand talents China; http://www.1000plan.org/groups/viewonetopic/928
89 One thousand talents China; http://www.1000plan.org/groups/viewonetopic/928
purchasing, finding jobs for spouses, and long term residence permits in order to enhance their level of technical development. Shanghai was the most successful city in involving returnees (Meng, Cerini 2014).

Local Governments implemented their own local schemes too, but with a greater focus on attracting high-tech entrepreneurs, rather than academics and scientists. For instance, since 2008, Jiangsu Province has invested RMB200 million (AU$ 41774107.50; AU$1 = RMB 4.79) per year to attract around 150 innovative and entrepreneurial talents annually.

The Thousand Talents scheme aimed to attract scientists and academics, specifically the ones with an academic title in internationally well-known Universities and Institutions, or senior managers within a well-known international company or banking institution, or inventors who developed technologies and patents and/or established their business abroad. Once the candidates were selected, the organisations received a considerable amount of money, which could be redistributed to the various projects. (Meng, Cerini 2014).

The Thousand Talents Program had the desired outcome. “The general view is that China is successful in enticing back top talent,” said David Zweig, director of the Centre on China’s Transnational Relations, at the Hong Kong University of Science and Technology. According to the Chinese Government, the number of returnees is estimated to be around 44,000 in 2007. In 2009, the number of returnees increased to 108,000. Xinhua News Agency reported that as far as 2013, the Scheme attracted more than 4,180 talents, including foreign talents. These experts undertook 2,886 national and local research projects, with the total funding of RMB 15.29 billion. Among the talents attracted, there are 3 Nobel laureates and 46 personalities from Academy of Science or Engineering of developed countries. This policy has had the effect not only to attract back home talented Chines migrants, but also high-profile international researchers, such as French Nobel Laureate Luc Montagnier, who won the 2008 Nobel Prize for Medicine for his discovery of HIV90.

The returnees mainly behave in two ways: some of them split their time between China and other countries, while the others work and have moved permanently in China. The most criticised aspects of the Thousand Talents policy is that first, not very many returnees go back to China permanently; second, that Chinese are much more likely to stay abroad after they get their PhD (Zweig). The data Table 38 showed by Professor Zweig at the US-China Institute on January 15, 2013 confirms this trend. Among the talents constituting the statistics sample (501), the ones who decided to stay in China in a full-time position consisted mainly of scientists and managers of enterprises and entrepreneurs, while the Ph.Ds and academicians preferred to be involved part-time in order to retain their tenured positions abroad, mainly in the US (Meng, Cerini 2014).

<table>
<thead>
<tr>
<th>Type</th>
<th>Full-Time</th>
<th>Part-Time</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-Innovative</td>
<td>99 (26.4%)</td>
<td>275 (74.6%)</td>
<td>374 (74.6%)</td>
</tr>
<tr>
<td>B-Innovative</td>
<td>36 (80%)</td>
<td>9 (20%)</td>
<td>45 (9%)</td>
</tr>
<tr>
<td>C-Entrepreneur</td>
<td>73 (89%)</td>
<td>9 (11%)</td>
<td>82 (16.4%)</td>
</tr>
<tr>
<td>Total</td>
<td>208 (41.5%)</td>
<td>293 (58.5%)</td>
<td>501 (100%)</td>
</tr>
</tbody>
</table>

**Notes:**
A. Innovative scholars working in universities and research institutes.
B. Innovative scientists or managers working in enterprises.
C. Entrepreneurial talents running own companies or with friends.

**Source:** Meng; Cerini 2014

2.2 INDIA: THE JAWAHARLAL NEHRU SCIENCE FELLOWSHIPS CASE STUDY

Both India and China have implemented policies to attract their talents back. In fact, India has promoted a programme to attract its best migrated researchers. The Indian Department of Science and Technology launched the Jawaharlal Nehru Science Fellowships, with the goal to encourage world-class research in Indian R&D research centres (Government of India 2014).

The Fellowship programme consists in attracting scientists of any nationality to carry out research in an Indian research centre for a period of 12 months in the course of three academic years. Key areas of research are Natural and Physical Sciences including Mathematics. Scientists can apply only if they have high academic distinctions accompanied with their election to the fellowships.

The fellowship offers a compensation of US$100,000 for 12 months and it allows flexibility to avail it anytime over the duration of the research. The Department of Science and Technology also provides also Rs.5.5 million Grant for R&D support to cover expenses to efficiently carry out their researches and get the instruments they need to achieve the desired final result (i.e. to travel to attend a conference). In addition, Host institutions provide every accommodation to the attracted applicants, from housing to high-level infrastructures to administrative support. Scientists are free to choose the host institution in India and the theme and scope of their research.

The Jawaharlal Nehru Science Fellowships initiative resulted in five distinguished scientists who were offered the first batch of fellowships during early 2014, and there will be a total of 25 fellowships on offer under this program for the period 2014-1791. This Scheme shows promise of favourable development and additional future success and can certainly be considered a ‘best practice’.

A study published in March 2011 (Will they Return? 2011) found that the vast majority of graduate students studying in the US were open to returning to work in India. Only 8% said they preferred not to return and only 4% said they would take any job (in the US) to avoid returning. This highlights the great potential of the initiative, as skilled people are in fact willing targets to return back to their own Counties.

India has been preparing this action for a long time. Figure 26 and 27 below show that India is progressively getting ready to welcome those talented researchers and scholars willing to return back. Not only does the country at issue have the largest number of higher education institutions in the world, but there also has been a significant growth in the number of universities over the last decade (Will they Return? 2011).

**Figure 26: Number of Higher Institutions in India, Comparison with China and the US**
2.3 THE VICTORIA-INDIA DOCTORAL SCHOLARSHIPS SCHEME CASE STUDY

Another best practice-initiative established by a State Government in the field of international cooperation in R&D is the Victoria India Doctoral Scholarships. The Scheme consents India and Victoria to share best practices and knowledge. It also allows encouraging world-class research and development by helping researchers building the skills needed to contribute to innovation and economic growth. Furthermore, the bilateral cooperation between Australian and Indian scholars allows them to become internationally disposed researchers by leveraging on encouraging each other’s cultural understanding, by learning from their skills and by fostering an international network.

The Australian Victoria India Doctoral Scholarship Program (VIDS) aims to increase Victoria’s knowledge capital and enhance relations between India and Victoria by attracting skilled Indian students and by supporting them in getting a doctoral degree in Victoria. The Doctoral Scholarships Program is funded by the Victorian Department of State Development, Business and Innovation, and is managed by the Australia India Institute. The scheme gives Indian doctoral students the opportunity to work with leading Victorian researchers in technologically advanced infrastructure and research facilities. Each scholar receives a scholarship of AUD$90,000 over the duration of their doctoral project and a full tuition waiver by the host university. Candidates will be selected based on the following criteria:

- A well-defined research proposal aligned with the University’s research strengths
- A research proposal that is relevant to the needs and interests of Victoria and India
- Leadership capability.

VIDS is now in its fourth consecutive year. So far, the Scheme has further developed the relationship between Victoria and India and has also created ambassadors for Victoria’s education system. To date, 23 scholarships have been awarded, and in 2015 up to 7 more of India’s brightest students will be given the opportunity to work on their PhD studies at an institution in Victoria.

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92 According to the Australia-India Institute, Melbourne’s Universities consistently rank in the world’s top 100 universities, and Melbourne ranks as one of the world’s top four student cities, offering a very welcoming lifestyle in a cosmopolitan community.
2.4 GERMANY: THE HUMBOLDT RESEARCH FELLOWSHIP PROGRAM CASE STUDY

The Alexander Von Humboldt Foundation was established by Germany in order to promote bilateral international cooperation in research, including in the field of R&D. The Humboldt Research Fellowship Program supports highly qualified post-doctoral scholars of all nationalities and disciplines so that they may carry out research projects in Germany. Key common requirements amongst the applicants’ research project are their creative potential and the innovative ideas.93.

Specific Programs are developed all around the world, in order to customize them to the local realities. An example of this kind of international cooperation is the Capes-Humboldt Research Fellowship in Brazil. The Capes-Humboldt Research Fellowship Programme is a joint fellowship programme with the Brazilian research funding organisation Capes. The sponsorship provisions refer to those of the Humboldt Research Fellowship Programme. The programme is jointly sponsored by the Humboldt Foundation and Capes and is currently scheduled to continue until the end of 201994.

In 2014, a total number of 944 Scholarships have been awarded around the world. Australia is in the top 10 countries of applicants’ origin. This highlights the success of the Program and the cutting-edge level of our students95. Appendix 5 provides for more detailed information.

Figure 28 shows in a glimpse the Fellowships and Awards granted in 2014 by the Humboldt Foundation.

<table>
<thead>
<tr>
<th>Region</th>
<th>North America</th>
<th>Europe</th>
<th>Middle East, North Africa</th>
<th>Asia</th>
<th>Sub-Saharan Africa</th>
<th>Australia, New Zealand, Oceania</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>172 (18.2%)</td>
<td>389 (41.2%)</td>
<td>32 (3.4%)</td>
<td>196 (20.8%)</td>
<td>47 (5.0%)</td>
<td>26 (3.8%)</td>
</tr>
<tr>
<td>Female</td>
<td>47 (27.3%)</td>
<td>236 (61.0%)</td>
<td>9 (28.1%)</td>
<td>49 (25.0%)</td>
<td>11 (23.4%)</td>
<td>36 (76.6%)</td>
</tr>
<tr>
<td>Male</td>
<td>125 (72.7%)</td>
<td>253 (39.0%)</td>
<td>8 (71.9%)</td>
<td>147 (75.0%)</td>
<td>36 (76.6%)</td>
<td>26 (3.8%)</td>
</tr>
</tbody>
</table>
| Source: Humboldt Foundation Statistics

93 https://www.daad.org/1883358
94 http://www.humboldt-foundation.de/web/capes-humboldt-fellowship.html
95 http://www.humboldt-foundation.de/web/statistics.html
2.5 EUROPE: MARIE CURIE ACTIONS (MSCA)

The Marie Sklodowska Curie Actions represent an undisputed ‘best practice’ in the field of R&D. MSCA research fellowship program is a set of mobility research grant schemes funding pre-and post-doctoral researchers in Europe as well as experienced researchers. The MSCA also support industrial doctorates by combining academic research study with work in companies and other innovative training, thereby enhancing employability and career development. The Marie-Curie Fellowship is a prestigious award aimed at fostering interdisciplinary research and international collaboration. The program can take the form of Individual fellowships (IF), as Research and Innovation Staff Exchanges (RISE) or as Innovative Training Networks (ITN).

The 2007-2013 budgets for the Marie Curie Actions amounted to €4.7 billion. Nearly half the funding (48%) supports Ph.D. training for researchers, with 24% allocated to fellowships for researchers with more than four years of post-Master’s experience. The remainder supports industry-academia partnerships.96

2.6 FOUNDATION ACTIVITIES

The policy of considering foundations as means to promote R&D international cooperation is to be considered a best practice. Foundations act as an instrument to allow brain circulation and hence encourage researchers’ mobility and international cooperation. There are several examples of the adoption of this policy around the world.

2.6.1 The Bill and Melinda Gates Foundation

The Bill and Melinda Gates Foundation sponsors partner organisations worldwide to face critical problems in several areas. One of them - the Global Health Division - aims to promote advances in science and technology to help the development of third world countries. Another one – the Global Policy & Advocacy Division - seeks to build strategic international research relationships. The Bill and Melinda’s Foundation approach to grant-making “emphasizes collaboration (and) innovation”97. The foundation does not operate on a nation basis but internationally, identifying challenges on a global level. The BMGF does not make grants outside its funding priorities; Tackling HIV is one of the highest research priorities for the foundation. Table 39 presents some of the most representative grant initiatives of the foundation (Source: Bill and Melinda Gates Foundation).

| Table 39 |
| GRANT OPPORTUNITIES PROMOTED BY THE BMGF |
| The Grand Challenge Fund98 | The GCF was designed to support collaborative projects of significant scale that engage in research to pursue the development of practical solutions to some of the key challenges world-wide. Health, Energy, the Environment and Food and water security have been the key themes so far99. |

97 http://www.gatesfoundation.org/
98 http://www.research.qut.edu.au/development/find/external/international/AISRF.jsp
99 http://gcgh.grandchallenges.org/GrantOpportunities/Pages/default.aspx
Operations Research on Improving Paper-Based Information Systems For Child Health

This international cooperation initiative seeks proposals for operations research on paper health information systems to improve the health of children in the developing world.

Amplifying The Nutrition Impact Of Agriculture In India

This project is focused on improving diet quality. As there are no established mechanisms or institutions dedicated to improving diet-related outcomes of agriculture, it is imperative to address these gaps. This Program seeks to address these gaps by funding a single partner or consortium to – amongst others - support translational research on the feasibility, scalability, cost, and impact of these integrating efforts.

Achieving Health Product Access Through Market-Based Approaches

The foundation relies on technical partners and researchers who can diagnose critical market dynamics problems and work to solve them. Through this initiative, the foundation invites applicants interested in receiving grant support to submit a proposal that identifies and solves market dynamics problems facing global health products. This is so to ensure that health products can be obtained at reasonable prices for the benefit of those most in need (the target are the developing countries). A small number of these proposals is selected and awarded of a grant. The resulting product of the research is used to work towards a solution in order to guarantee health product access to areas where it is normally prevented.

The Bill and Melinda Gates Foundation has achieved outstanding results so far. The following table gives a brief account of the success of the activity of the foundation.

<table>
<thead>
<tr>
<th>Table 40</th>
<th>STATISTICS_ BILL AND MELINDA GATES FOUNDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total grant payments since inception</td>
<td>$33.5 billion</td>
</tr>
<tr>
<td>Total 2014 Direct Grantee Support</td>
<td>$3.9 billion</td>
</tr>
<tr>
<td>Total 2013 Direct Grantee Support</td>
<td>$3.6 billion</td>
</tr>
<tr>
<td>Current number of foundation employees</td>
<td>1,376</td>
</tr>
<tr>
<td>Foundation Trust Endowment</td>
<td>$42.9 billion</td>
</tr>
</tbody>
</table>

Geographic Reach

In the USA

The foundation supports grantees in all 50 states and the District of Columbia.

Internationally

The foundation supports work in more than 100 countries all around the world.

Source: Foundation Fact Sheet (31/03/2015), Bill & Melinda Gates official website

Moreover, in November 2014, the Bill & Melinda Gates Foundation announced the adoption of an open access (OA) policy for publications and data, "to enable the unrestricted access and reuse of all peer-reviewed published research funded by the foundation, including any underlying data sets". The OA policy started to be effective as of 1 January 2015 and it requires that all publications resulting from foundation funding, and all the data underlying published research, is to be available upon publication. This concept of knowledge-sharing has been acknowledged worldwide to be an innovative way to promote international research cooperation and development.

100 http://www.impatientoptimists.org/Posts/2014/11/Knowledge-is-Power#.VZH1JfmqpBc
2.6.2 The Korea Foundation

The Korea Foundation was established by the Korea Foundation Act, promulgated on December 14, 1991. Its goal is to enhance the image of Korea in the world and also to promote academic and cultural exchange programs. It is an independent organisation strictly connected with the Korean Ministry of Foreign Affairs. The mission of The Korea Foundation is to promote international cooperation, including in the field of R&D. Table 41 gives an account of the activities promoted by the Korea Foundation.

Table 41  
ACTIVITIES PROMOTED BY THE KOREA FOUNDATION IN INTERNATIONAL COOPERATION  
2016 PROGRAMS

<table>
<thead>
<tr>
<th>Program</th>
<th>Details</th>
</tr>
</thead>
</table>
| Fellowship                             | • Field Research  
|                                        | • Graduate Studies  
|                                        | • Postdoctoral Research                      |
| Support for Korean Studies Overseas    | • KF Global e-School  
|                                        | • Support for Establishment of Professorships |
|                                        | • Support for Employing Teaching Staff and Visitor Professors |
| Other Programs and Initiatives         | 3. Inviting Distinguished Individuals from Overseas  
|                                        | 4. Grant Support for K-Publications in non-Korean language |

*Source: 2016 KF Program Guidelines*

2.6.3 The Korea-Australian Foundation and the Australia-Korea Foundation

In 1991, the Government of the ROK announced the formation of the Korea-Australia Foundation (KAF). The Board of the KAF includes high-profile Korean representatives from the Government, the academic and business world. The KAF supports overseas Korean Studies program as well as numerous academic conferences and international cultural programs.

The Australia-Korea Foundation (AKF) is the Australian counterpart of the KAF. It was established by the Australian Government in 1992 in order to promote bilateral relations between Korea and Australia. The objectives of the foundation are:

- to increase public awareness of Australia in Korea and of Korea in Australia;
- To develop partnerships in areas of shared interest
- To increase their capacity to effectively engage with each other.

The AKF offers annual grant funding to organisations and individuals to promote projects or activities which encourage Australia’s engagement with Korea. These comprise exchanges, partnerships and other form collaborations that involve R&D (i.e. in the area of business, education, and academia). Normally the grants awarded are in the range of AUD20,000 - 30,000. The AKF gave a significant contribution in promoting the Korea Australia Emerging Research Leaders Exchange Program, a bilateral international collaboration program that aims to foster individual and institutional R&D linkages between Australia and Korea in the field of S&T. In 2015, six Australian researchers went to Korea; in 2014, six Korean researchers came to Australia.

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103 http://www.atse.org.au/content/international/australia-korea-emerging-leaders-program.aspx
“It takes time to develop cooperative partnerships based on mutual trust and respect. Such relationships demand commitment to a long-term vision and active pursuit of shorter-term goals that signal achievement and progress” (SA Government 2015c).

Today’s leading economies analysed in the report – Europe, US, Canada, South Korea, Japan, Singapore, China and recently Australia – all share a common trait: they are among the biggest investors in R&D. This confirms that the higher the average R&D intensity, the bigger the economic rebound will be. In particular what has risen to the surface is the importance of international cooperation in R&D as a long term strategy to foster socio-economic national and regional development.

In the past decade Australia has started levering on R&D as a result of the understanding that today’s world economy and progress are based on technological innovation. In particular, Australia experienced a high degree of internationalisation in R&D mainly with North Atlantic countries - and recently with China and India - as a consequence of acknowledging the crucial role it plays as a main driver of technological innovation and hence of economic growth.

There are two main concepts behind the growing awareness of the importance of international research cooperation. The first one is that the world is dynamic and advancing quickly. Also, it is no more enclosed in its geographical national borders but it is becoming increasingly globalised. The impressive technological advancement experienced worldwide in recent decades encouraged greater circulation of people, information and knowledge. As a result of this globalisation, people and specifically researchers broadened their minds and horizons, nowadays they are more willing to physically move and work internationally as part of their very own research activity. The best way to take advantage of today’s world’s dynamism is to join efforts to be in the international network and to foster development and innovation. Indeed, every country has specific areas of expertise, resources and priorities, and creating an international alliance allows to put forward each other’s strengths and to compensate the respective weaknesses in a “win-win” strategy. In particular, it is critical for a small State like South Australia to invest in the attraction of external (human) resources and knowledge, and international collaboration seems to be an effective way to do so.

The second concept is that today’s world is very competitive, and the agents involved are always striving to find cutting-edge solutions and to stay on the forefront of technological development through the commercialisation of research results. The idea that lies behind it is to pursue a disruptive economy. The latter refers to a new lens through which to conceive economy, it encourages finding new ways to foster progress, leaving behind the old and explored paths to pursue technological innovation. It is a shared economy type of paradigm, rooted in sharing human capital and resources and the knowledge produced in a way that benefits all the counterparts.

The main finding of this analysis is that ultimately growth is led by highly talented individuals. Human capital has proven itself to be crucial in encouraging international R&D collaboration and technological innovation. Hence, the strategy of talent-attraction is to be considered the best practice to create network, foster innovation and consequently lead to economic growth. The theory that backs up this strategy is that talented people seek out chances to grow and they would be keen to collaborate with organisations that provide good opportunities to do so. This is likely to generate a virtuous cycle as, if people are developing themselves faster and better than they could anywhere else, why would they leave? Another positive outcome of this – other than attracting and retaining gifted researchers – is that talent creates more overall opportunities to foster innovation and fuel
growth as it acts like a magnet for more talent according to the formula “talent attracts talent” (Talent Magnetism 2013).

The Chinese Thousand Talents Program, the Indian Jawaharlal Nehru Fellowships, the Australian Victoria-India doctoral Scholarships Scheme, the German Humboldt research Fellowship Program and the European MSCA are brilliant instances of the Talent-Attraction best practice. The idea behind this approach is to encourage the new phenomenon of Brain Circulation as opposed to the traditional one of Brain Draining, which has now been overcome. The activity of various Foundations around the world is becoming increasingly important to promote the idea of brain circulation, and in general the concept that ultimately behind progress there is the joint international effort of individuals. Their activity in support of the Talent Attraction Strategy is to be considered a ‘best practice’ as well.

The benefits that Australia can achieve from an intense international cooperation in R&D with North Atlantic Regions (Europe, USA and Canada) and with Asian countries such as India, South Korea, Japan, Singapore and China are enormous. First of all, international cooperation in R&D improves research quality, heightening Australia’s overall global profile. International collaboration encourages fruitful exchanges of ideas and experiences, bringing together different visions and perspectives that result in a general improvement of the research product. In a spirit of collaboration, counterparts are more easily prone to give access to their own knowledge and information.

International collaboration is also an opportunity to share large project experiences and expertise. The bigger the pool of resources and cutting-edge infrastructures, the higher the potential and the quality of the research outcome will be.

Moreover, international cooperation enables markets to open up and to explore possibilities previously not accessible as a result of the added and compensatory value brought by international cooperation. In particular it favours the development of new technology companies and the establishment of new international centres of excellence by joining financial efforts and world-class talents. An example is provided by the activity of the Korea-Australian Foundation and the Australia-Korea Foundation, that cooperate to promote bilateral relations between Korea and Australia by developing research partnerships in areas of shared interest, increasing their capacity to effectively engage with each other.

Strengthening international cooperation in R&D is fundamental to generating high-quality knowledge, stimulating the commercialisation of research results. This enables the creation of first-rate products and services, and allows innovative businesses to prosper. It is a vision that supports the idea of a disruptive economy, where an innovative ecosystem leads to competitiveness through the development of complex products and services involving cutting-edge research in sectors such as advanced manufacturing, ICT, renewable energy, food processing and health industry.

Finally, an important benefit for Australia in cooperating internationally is the creation of and access to a global network. Cross-country collaboration contributes greatly to the development of valuable contacts that tend to have positive flow-on effects on sectors other than research. For instance, it brings governments together enhancing partnerships and the development collateral initiatives between Australia and its partner-countries, with a positive rebound in the overall national growth.

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104 In accordance with the Federal Government Strategy “Boosting the Commercial returns from Research”.

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WillTheyReturn? (2011), The willingness of potential faculty to return to India and the key factors affecting their decisions; by David Finegold, dean of the School of Management at Rutgers University in the US and B Venkatesh Kumar, professor at the Tata Institute of Social Science in Mumbai.
Appendices

Appendix 1: Australian Collaboration with Foreign Countries on ARC Grants (%)
The figure below represents the percentages of Australian collaboration with foreign countries on ARC grants in the time span from 2011 to 2015.

![Collaboration Percentage Chart]

Source: Australian Government_ARC

Appendix 2: Projects Developed In the Context of AUS-EU Cooperation

Meaningful projects have already been developed in the context of AUS-EU cooperation. The FEAST project was a platform that promotes cooperation at the level of researchers and research stakeholders. The project was launched in Canberra in 2001 and was economically supported both by the EU and by Australia. FEAST undertook a study of how open Australia’s R&D programs were to European collaboration (via the EU-funded AusACCESS4EU project). The results indicate a high degree of openness. The FEAST initiative has now come to an end, but it is proceeded by a new project, Connecting Australian and European Science and Innovation Excellence (CAESIE).

**AUS-ACCESS4EU project** aimed to enhance European Union and Australian cooperation in science and innovation by investigating and reflecting upon the current state of European researchers’ access to Australian funded research, technological development and innovation programmes and facilities. The objective of the AUS-ACCESS4EU was to increase S&T collaboration between the EU and Australia by identifying such access opportunities, and by widely disseminating this information to the European research community. The Access4EU-Project identified 19 programmes for STI cooperation. AUS-ACCESS4EU succeeded in increasing awareness in Australia about EU interest in Australian S&T and it increased awareness of S&T cooperation with Australia among EU researchers. It also heightened the participation of EU researchers in Australian R&D programmes.

Appendix 3: Bilateral Collaboration of Past and Present Us-Australian Cooperation in R&D

In this appendix, divided by field of research, some of the most significative bilateral collaboration of past and present US-Australian cooperation in R&D are discussed.

**Technology (ICT).** Researchers from the University of New South Wales (UNSW) in Sydney, the National Renewable Energy Laboratory in Colorado and Emcore Corporation in New Mexico have
created a very efficient solar cell combination, proving the strength of years of US and AUS joint solar research. The R&D collaboration between Australia’s Origin Energy and US Micron resulted in the implementation of a new kind of solar cell invented at the Australian National University (ANU), now used in a factory in Boise, Idaho. This AUS-US joint venture will make a new type of solar cell there, known as sliver cells.

In Pittsburgh, Pennsylvania, AUS-US cooperation allowed East Penn Manufacturing to secure license and funding to make a new kind of battery for storage of renewable energy. It was developed at Australia’s national science agency, CSIRO. The technology will also be used in the production of hybrid cars. Discoveries by Australian CSIRO astronomer-engineers allowed the development of internet wireless connection, that had a significant impact not only in the U.S., but also worldwide.

**Health.** International bilateral cooperation in R&D helped the development of a cochlear implant or bionic ear that allows the hearing-impaired to recover from their auditory condition. Technologies such as the bionic eye are soon to be developed. The Bionic Ear Institute (BEI) has strong US links and several National Institutes of Health contracts. BEI’s research has also been developed into sound processing technologies used widely in phone headsets, and in a new generation of low cost, self-fitted hearing aids developed by America Hears and Australia Hears.

American women have now access to vaccines that prevent cervical cancer. These efforts are in strong cooperation with Australian researchers and their investigations at Australian the University of Queensland. In fact, those vaccines are largely the invention of Professor Ian Frazer and his team at the University of Queensland. Professor Frazer worked with Australian Biotechnology Company CSL, Ltd. and US pharmaceutical corporation Merck & Co. to commercialize Gardasil. The vaccine is now recommended for adolescent girls by the US Food and Drug Administration as a protection against cervical cancer.

CSL is also the world’s second biggest manufacturer of blood products with major research and manufacturing capability in the US. Here it collects and fractionates plasma to create highly specialised medicines for people with chronic life-threatening diseases such as primary immune deficiency, bleeding disorders and other rare diseases.

Medical trials in the US on a new imaging technique developed by the Australian Nuclear Science and Technology Organisation (ANSTO) could open a window into new diagnostic options for patients with Alzheimer’s disease or Parkinson’s disease. An agreement with Bayer Schering Pharma stems from studies performed by ANSTO scientists who discovered new ways to obtain images of neuroinflammation, believed to be an early characteristic of these debilitating diseases.

IBM is collaborating with the government of the Australian state of Victoria and the University of Melbourne to develop a supercomputer. The initiative is known as the Victorian Life Sciences Computation Initiative, the effort aims to enhance life sciences research by providing computer resources to generate complex simulations of biological systems. The program has already led to the first simulation of a complete polio virus.

Staff from the Menzies School of Health Research in Darwin in Australia’s Northern Territory is working with colleagues at the Northern Arizona University to develop a test that will enable doctors to diagnose patients with melioidosis (a disease caused by bacteria known as Burkholderia pseudomallei) more rapidly.

Other instances of US and Australian Bilateral Academic Research cooperation is represented by the investigations of those researchers that are working together to enhance biosecurity, studying emerging threats such as Hendra and Nipah viruses. When they emerged, killing people and animals in Australia and Southeast Asia, virologists at CSIRO’s Australian Animal Health Laboratory (AAHL) with support from their colleagues at the Center for Disease Control in Atlanta and the US Department of Agriculture’s (USDA’s) Plum Island facility quickly identified the new viruses and showed that bats were the carriers.
Agriculture and Biosecurity. The AUS-US R&D cooperation had an impact in Texas, where cotton farmers started growing crops that use less water, less pesticide and produce better cotton with the help of CSIRO-derived plant varieties. Other similar developments will follow agreements signed by an Australian biotech company, Hexima, with the three largest agrichemical businesses in the US—Dow, Monsanto and DuPont. In February 2010 Hexima entered research cross licences with Monsanto; and in March 2010, Hexima scientists produced the first transgenic corn plant as part of a collaboration with the DuPont business, Pioneer Hi-Bred International. American scientists working in Brisbane are testing biological controls to fight against invasive plants that threaten the Florida Everglades, while NASA technology is helping Australia cope with its locust plagues. Even more, teams across both countries are trying to understand what is killing frogs worldwide. Through the Cooperative Research Centre for National Plant Biosecurity (CRCNPB), Australian researchers are working with Cornell University to trial a new pruning regimen for grape vines to control the destructive black rot caused by the fungus Guignardia bidwellii.

Environment, Climate and Earth Observation. U.S. and Australian R&D is going towards the direction of producing aviation fuel sustainably using green algae. The companies involved in the project are the aircraft manufacturer Boeing and California biotech company Amyris, which joined the Queensland Government, the University of Queensland and the airline Virgin Blue. At the Queensland University of Technology, Syngenta Biotechnology, Inc. of North Carolina and Australian company Farmacule are using molecular technologies to develop efficient ways of producing the transport fuel and chemical feedstock bioethanol from 'bagasse', a sugarcane residue. The applications of it would allow the recycle of waste generated by the sugar industry and the production of an environmental friendly fuel. An example of academic international collaboration between Australia and the US is given by Australian chemist Dr. Deanna D’Alessandro: She studied in a postdoctoral fellowship at the University of California, Berkeley and then cooperated with the University of Sydney as a postdoctoral research fellow. Dr. D’Alessandro is studying ways to create molecular sponges that will clean up almost any gas, and then release it on cue by using the crystals full of minute pores she has constructed.

CSIRO has made a long-term contribution to improved climate prediction through monitoring the Southern Ocean since 1994. Through agreements with NOAA, NASA, and the Scripps Institution of Oceanography in San Diego, a ground station in Hobart, operated by the Australian Centre for Remote Sensing, has been downloading climate-relevant data from passing US polar orbit satellites. Australian and U.S. researchers are also collaborating to develop the latest remote sensing technology to fight forest fires. The collaborations have been reinforced following the recent devastating wild fires in Victoria, Australia, and in California.

Astronomy. Great strides in astronomy are taking place in Hawaii through scientific analysis of infrared light as American scientists utilize one of the world's largest optical telescopes to observe previously unseen aspects of our solar system. These efforts are in strong cooperation with, and would not be possible without significant contributions by Australian scientists and their development of such instruments at ANU. Just as well, astronomy technologies developed in Australia are equipping US telescopes, and these will help to find other applications such as earthquake monitoring.
Mining. In Nebraska, Cold War technology, adapted by Australian mining company BHP Billiton, is being used to find rare earth mineral deposits from the air. The technology has redeployed US Navy technology that detects minute changes in gravity. Known as Falcon, the sensor is an airborne detector which can be used to scan the landscape for deep ore bodies.

Defence. Australian company Electro Optic Systems is involved in a strategic alliance with US-based global defence company Northrop Grumman. As part of this union, Northrop Grumman implemented instruments and sensors to detect and characterize objects in space developed by Electro Optic Systems.

Appendix 4: Top 10 Countries of Origin for Humboldt Fellowships and Awards (2014)
The table below shows the Top 10 countries of origin for Humboldt Fellowships and Awards Granted in 2014 (Source: Humboldt Foundation DE).

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Humboldt Fellowships &amp; Awards Granted in 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>141</td>
</tr>
<tr>
<td>China</td>
<td>93</td>
</tr>
<tr>
<td>UK</td>
<td>47</td>
</tr>
<tr>
<td>India</td>
<td>38</td>
</tr>
<tr>
<td>Spain</td>
<td>38</td>
</tr>
<tr>
<td>Italy</td>
<td>34</td>
</tr>
<tr>
<td>Canada</td>
<td>31</td>
</tr>
<tr>
<td>Australia</td>
<td>29</td>
</tr>
<tr>
<td>Brasil</td>
<td>28</td>
</tr>
<tr>
<td>France</td>
<td>28</td>
</tr>
</tbody>
</table>

Appendix 5: The Three Main South Australian Universities
(Source: Meng, Cerini 2014)

There are the three main South Australian Universities, namely UniSA, Flinders University and Adelaide University.

The University of Adelaide is consistently ranked in the top 1% of universities worldwide and is member of the Group of Eight: a coalition of prominent Australian universities, with intensive commitment in research. In fact, it is associated with 5 Nobel Prize winners and its strengths in intensive research include: bio-medical sciences, physical sciences, engineering, IT, food & wine and social sciences. The university accounts for 25,000 students including over 6,500 international students from over 90 countries.

The University of South Australia, having more than 33,000 students, is the largest university in the state. It has a strong reputation in conducting research in partnership with industry and it has the State’s largest share of international students.

Flinders University is a noted institution for its excellent research and student satisfaction therefore it has been awarded in 2004 and 2006 with the Prime Minister’s Award for University Teaching. Flinders University accounts for 21,787 students of which 3,798 are overseas students and the full-time employment rate of Flinders’ graduates is higher than the national average.