INVESTING IN SCIENCE

AN ACTION PLAN FOR PROSPERITY THROUGH SCIENCE, RESEARCH AND INNOVATION

Government of South Australia
A State Government response to
Investing in our prosperity:
The role of science, research and innovation,
Premier’s Science and Industry Council
Message from the Premier and Minister

Introduction

The seven pillars of a coordinated action plan

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

Implementation

Resources

Research compass
Science, research, education and innovation go to the heart of South Australia’s capacity to develop a strong economy that brings lasting benefits to our community.

That is why our Economic Statement highlights the importance of boosting interest and participation in science, technology, engineering and mathematics (STEM) as part of our broader strategy to develop a smart economy.

South Australia has a proud history of creativity, industriousness and innovation. Our record of scientific achievement includes four Nobel Laureates with direct links to our State. This research and entrepreneurial endeavour has contributed enormously to our health, wellbeing and economy.

Our past achievements put us in good stead for meeting the future challenges and opportunities of global markets and in transforming our economy.

Keys to our success will be our excellence in science and research and ability to innovate to solve emerging challenges.

Our goal is to stay ahead of the competition by making the most of South Australia’s strengths in areas such as advanced manufacturing, food and agriculture, environmental management, defence, health and service related areas.

To achieve this we need to position South Australia to be the leading State in Australia and one of the global leaders in STEM.

This is a bold challenge but one that we must embrace if we are to continue to be globally competitive.
South Australia’s Chief Scientist, Professor Don Bursill, and the Premier’s Science and Industry Council made a number of recommendations to help achieve this goal in their report *Investing in Prosperity: The role of science, research and innovation*. We thank them for this advice and for shaping the debate on the role of science in our State’s future prosperity.

*Investing in Science* responds to this advice and the South Australian Government strongly endorses the Council’s recommendations.

More broadly, a total of around $170 million\(^1\) in funding a year is provided from a number of revenue sources to support actions outlined in *Investing In Science*.

This action plan outlines measures we will take to position South Australia to continue our proud legacy. Our long term goal is to be a leader in Australia and globally, to be renowned for our scientific and research excellence and as a State that creates, innovates and inspires.

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\(^1\) Refer to resources table on page 40.
Introduction

The South Australian Government has established strategic priorities for South Australia and an economic vision for the future that includes:

- growing advanced manufacturing;
- premium food and wine from our clean environment;
- an affordable place to live;
- realising the benefits of the mining boom for all;
- creating a vibrant city;
- every chance for every child; and
- safe communities, healthy neighbourhoods.

Science, research and innovation play vital enabling roles in reaching our goals and in transforming the State’s economy by improving our productivity and competitiveness. This is particularly the case in our manufacturing sector but also in agriculture, mining and resources, health and many service sectors of our economy.

The rapid pace of technological change, as well as the critical role of information and communication technology (ICT) will see increasing employment in knowledge based industries. The ICT sector alone already employs 460,800 Australians and contributes nearly 8 per cent of Australia GDP.

South Australia needs to strengthen its efforts to increase the number of STEM graduates if we are to remain competitive. Countries in our region are accelerating investment in their science and research capacity. In 2002, around 22 per cent of graduates from Australian universities were in STEM related degrees compared to 52 per cent for China, 64 per cent for Japan and 41 per cent for South Korea. By 2010, the proportion of students graduating in STEM related disciplines had dropped to 18 per cent in Australia.

The Premier’s Science and Industry Council highlighted the increasing importance of science, research and innovation in its report Investing in Prosperity: The role of science, research and innovation.

The Council has recommended that the Government move to enhance the State’s research capabilities especially through investment in research leaders and early career researchers to better translate our research effort into commercial outcomes.

The Council has also highlighted the important role that State Government agencies can play in driving innovation within their departments and areas of portfolio responsibility.

Improving community understanding and support for science and research is essential to attract people into the many exciting career opportunities in our State. The State Government fully supports the Chief Scientist’s call to improve public communication of science in South Australia.

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2 Australian Workforce and Productivity Agency (2013) ICT Workforce study, page 40
In response to the Premier’s Science and Industry Council recommendations *Investing in Science* incorporates seven key pillars that are closely interconnected.

*These are:*

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
Economic Statement 2013

‘The transformation of knowledge combined with business creativity, leads to new products and market opportunities’.
INVESTING IN SCIENCE

INVESTING IN PEOPLE, OUR CURRENT AND FUTURE RESEARCH LEADERS

Objective
To attract and retain high calibre researchers in South Australia and build the capability of existing researchers.

Why this is important
South Australia has a proud history of scientific and technological innovation and our universities and research institutions conduct world class research in many areas relevant to the State’s economy.

The Excellence in Research for Australia evaluation found that disciplines at South Australia’s universities assessed to be at world standard or above increased from 68 per cent in the period 2003 to 2008 to 81 per cent in the period 2005 to 2010.

Experience has shown that attracting and nurturing world leading researchers not only builds the State’s research capabilities and knowledge base but also leads to the growth of centres of excellence and provides significant economic benefits to the State.

Australia has an ageing research workforce creating the potential for a shortfall in the number of experienced researchers needed to undertake world-leading research and with the skills required by industry.

Increasing the participation of women in scientific and technological research will help to address any potential shortfall in the researcher workforce.

Attracting world leading researchers to South Australia, as well as nurturing our early and mid-career researchers, will continue to be an important focus in the future, as recommended by the Premier’s Science and Industry Council.

Strategies
1. Increase support for programs that attract top researchers from around the world to South Australia.
2. Increase support for early and mid-career researchers to engage with industry led research activities.
3. Provide pathways for early career researchers to strengthen business connections and translate good ideas into commercial and applied outcomes.

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INVESTING IN SCIENCE

Key actions/initiatives

In response to the recommendations of the Premier’s Science and Industry Council, the State Government will:

- Increase the number of South Australian Research Fellowships offered to three per year - these Fellowships, each worth up to $1 million over four years, are designed to attract global research leaders to South Australia.

- Increase the number of Catalyst early-career researcher grants to up to 15 per year to provide the next generation of research leaders with industry focussed research experience.

- Introduce new grants to provide up to five collaborative projects for mid-career researchers to work with industry partners on research and collaborative projects, including with international partners.

The Office of Science, Technology and Research within the Department of Further Education, Employment, Science and Technology will work with South Australian universities to develop opportunities for early career researchers to participate in industry based training and development programs. This will help position the next generation of researchers to work more closely with industry and provide a practical way for new partnerships to be formed between the research and business communities.
CASE STUDY
INSTITUTE OF PHOTONICS AND ADVANCED SENSING

Professor Tanya Monro arrived in Adelaide in 2005 as the inaugural Chair of Photonics at the University of Adelaide, supported by funding from the Defence Science and Technology Organisation.

Her practical approach of using fundamental research to find solutions to industry problems attracted an investment of $250,000 from the Premier’s Research and Industry Fund to assist with extending photonics technologies to other fields such as health and environmental monitoring.

Professor Monro recently received the prestigious Georgina Sweet Australian Laureate Fellowship, recognising her as one of Australia’s top scientists. She has also secured substantial funding to establish the Sensing Technologies for Advanced Reproductive Research Laboratory, $92 million in funding for the Braggs, and $23 million for the Australian Research Council Centre of Excellence for Nanoscale BioPhotonics.

The Braggs building incorporates the headquarters of the Institute of Photonics and Advanced Sensing at the University of Adelaide and was supported by a $5 million contribution from the State Government. The building is home to around 100 staff and some 200 students and brings together physicists, chemists and biologists to pursue a new trans-disciplinary approach to science.

In 2012 the Premier’s Research and Industry Fund – South Australian Research Fellowships awarded $1 million over five years to the Institute for Photonics and Advanced Sensing to help attract another top researcher Professor Andre Luiten to South Australia.

Professor Luiten is Chair of Experimental Physics at the University of Adelaide and is working to develop new types of laser instruments capable of determining measurements that were not previously possible. Professor Luiten has brought to South Australia more than $2 million worth of equipment and seven staff, including a number of high-quality postgraduate students and post-doctoral staff.
The Braggs building, The University of Adelaide
Australia’s Chief Scientist has urged governments, community and industry to reverse the decline in STEM education, highlighting that participation in university level STEM education in China, Japan and South Korea is double that of Australia’s\(^1\). South Australia has led the debate on STEM skills. We were the first state to release a STEM strategy and we lead the nation in the delivery of an increase in STEM primary teaching time.

The State Government is committed to South Australia matching the top five countries globally in science and mathematics by 2025. This is in line with the Australian Chief Scientist’s recommendation for Australia. We have renewed our focus on primary and secondary school numeracy and literacy, supporting more young people to think critically and innovatively, and solve complex problems. We have also significantly invested in STEM vocational education and training, and digital literacy. But there is more to do.

Research indicates that at age 15, over half of South Australian students enjoy studying science. Despite this, 40 per cent of students stop studying chemistry and physics between Year 11 to Year 12\(^1\). Research also shows that only 10 per cent of female university applicants who studied STEM in Year 12 had a STEM university course as their first preference, in contrast to 36 per cent of male applicants\(^1\).
SA STEM Skills Strategies

1. Raise awareness of the importance of STEM skills to South Australia’s future.

2. Invest in STEM teaching in primary and secondary schools, particularly in mathematics.

3. Encourage people with an aptitude and interest in STEM to pursue these options.

4. Invest in and recognise the importance of STEM training and re-skilling in contributing to skills and business growth, particularly in relation to technology.

5. Deliver programs to encourage digital literacy and participation in the digital economy.

6. Work with industry to develop mechanisms to attract and keep workers in STEM careers, with a particular focus on women.

Key actions/initiatives

In response to the recommendations made by the Premier’s Science and Industry Council, the State Government will:

- Increase the communication and promotion of STEM activities to the community, students and industry.

The State Government will also:

- Launch STEM Australia, an online portal to raise the importance of STEM to students by promoting STEM events, education programs, and providing career advice.

- Further increase primary school teaching time for science to the western European average of 9 per cent, as recommended by the Australian Chief Scientist, by 2025.

- Lift numeracy achievement in government schools through implementation of Great Start - Strong Foundations - Powerful Learners: Birth to 18 Numeracy and Literacy Strategy.

- Expand the number of government schools with a strong focus on STEM learning and with strong connections to post school STEM education.

- Continue to invest in professional development for government school leaders and teachers to improve teaching practices in STEM subjects.

- Equip teachers, parents and students in government schools to improve learning outcomes in STEM by using the Australian Curriculum year-by-year achievement standards to assess and report achievement for each and every student.

- Work with universities to strengthen pre-employment training for STEM teachers and encourage an increase in STEM specific teaching for primary and middle school teachers.

- Increase by 5 per cent a year the number of students in vocational training undertaking STEM studies through Skills for All.

- Work with industry and educators to increase opportunities for young people to experience STEM in the workplace as part of their school education.

- Continue the Women at Work Strategy and identify opportunities within all STEM initiatives to include and encourage women to participate in STEM education and career pathways.


9 A report from the Committee on STEM Education National Science and Technology Council.


13 Science 21, Westwell M, Buxton B (June 2012) STEM skills strategy for South Australia: Factors that influence young people’s decision making. Produced for DFEEST to support the STEM Skills Strategy.

14 Female Participation in STEM Study and Work in South Australia 2012, DFEEST.
CASE STUDY
SKILLS FOR ALL

*Skills for All* is a State Government commitment to increase the skill levels, lift workplace participation and increase productivity by offering training for existing employees and those breaking into the workforce. The State Government’s significant investment in *Skills for All* means that many South Australians now have the opportunity to gain qualifications through a *Skills for All* Training Provider of their choice.

Developing a strong workforce skilled in STEM is critical to the future growth in industries such as advanced manufacturing, food, forestry, defence, resources technology and medical devices.

*Skills for All* has provided vocational education and training qualifications for priority STEM related courses such as electrotechnology, electronics, and competitive manufacturing.

The State Government under *Skills for All* has invested around $25 million in building the state’s STEM skills.

Abbey Suckling is studying for a Certificate III in Electronics and Communications at TAFE SA, while also working in an apprenticeship.

Interested in hands-on work, Abbey was attracted to electronics because of its impact on everyday life.

“Science and electronics is all around us and I wanted to find out more,” Abbey says.

Starting in Year 11 through a school-based apprenticeship, Abbey was a finalist in the South Australian Training Awards in 2012 and was awarded the 2012 Australian Vocational Student Prize by the Commonwealth.

“I’d recommend anyone to take the opportunity to learn more and I truly believe people will succeed if they study something they like and enjoy. I wanted to get going with my life and earning while I’m doing my apprenticeship is a great incentive,” Abbey says.

“The skills I’m learning now will be with me for life, both on a professional and personal level, which is a terrific advantage.”
CASE STUDY
DEFENCE SCIENCE AND TECHNOLOGY ORGANISATION

Defence science work has been conducted in Australia since 1907 and today the Defence Science and Technology Organisation (DSTO) is Australia’s second-largest publicly funded research agency. The organisation’s role is to ensure the expert, impartial and innovative application of science and technology to the defence of Australia and its national interests.

In South Australia the DSTO’s research facilities at Edinburgh employ over 1,200 staff conducting specialist research and development activities in fields as diverse as radar, guided weapons, opto-electronics, electronic warfare, human factors and operations analysis.

The DSTO’s excellence in science and technology is fundamental to ensuring the Australian Defence Force’s capabilities remain leading edge. The organisation partners with other world-class capabilities locally, nationally and internationally through strategic alliances to address significant defence and national security challenges.

Through the STEM Skills Strategy and a range of higher education initiatives, the State Government is working to deliver a pipeline of skilled workers to support the defence industry’s long term workforce needs.
INVESTING IN SCIENCE

OECD data from 2008 show that just under 30 per cent of all researchers in Australia work in business enterprises. This compares to over 75 per cent in countries such as Japan and Korea, and just under 60 per cent in Finland and Germany.

Government has an important role to play in fostering research skills and strategic partnerships, including through developing hubs and clusters of industry and research expertise or through providing incubator facilities to help new start-up businesses grow.

Why this is important

Science and research are major drivers of innovation and economic growth. The State Government regularly partners and co-invests in science and research projects with the Commonwealth Government, universities and industry. Over the period 2004-09 this has resulted in the State co-investing more than $200 million into projects that have leveraged Commonwealth and other investment close to $1.2 billion.

The return on investment in cooperative research projects has a significant impact on areas of strategic importance to the state, such as in our food and agricultural sector. The South Australian Research and Development Institute reports a 55 per cent return to the rural industry from its investment in research and development activities.

Despite the clear gains to be made from investing in science and research, the extensive research and skills capabilities of South Australia’s universities and research institutions are largely untapped by many local businesses.

Strategies

1. Develop new centres of excellence that align to state priorities to support the clustering of organisations that promote the exchange of knowledge, innovation and value adding activities.

2. Support the highest quality bids for Commonwealth funding such as the Cooperative Research Centre and Australian Research Council programs, especially those that align to state strategic priorities.
**Key actions/initiatives**

*The Government will invest:*

- $4.1 million over four years for the *High Value Food Manufacturing Hub* (Food Hub), which commences operations from early 2014. The Food Hub will support the translation of applied research to value-add to our primary produce and create greater export opportunities for local manufacturers.

- $6 million over four years in partnership with industry to create a *Mining and Petroleum Services Centre of Excellence*. The centre will bring together resource companies, research institutions and service businesses to foster and coordinate innovation and applied research initiatives. This will support the development of supply chains with local suppliers that provide high value added products and services. It will also drive new and innovative ways of overcoming barriers to resources industry growth, to support unlocking of our minerals and energy wealth.

- $3 million over three years to 2015-16 to continue to support Cooperative Research Centres of strategic importance to South Australia.

- $4 million over two years to 2014-15 to fast-track exploration and research in the Gawler Craton region of South Australia, in partnership with mining companies. This work is part of the Plan for Accelerated Exploration (or PACE 2020).

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CASE STUDY
COOPERATIVE RESEARCH CENTRES IN SOUTH AUSTRALIA

The returns from cooperative applied research are well illustrated by the State Government’s annual $1.2 million investment across 10 Cooperative Research Centres (CRC) operating in South Australia.

The CRC program is a long running Commonwealth Government initiative that provides a bridge between industries, universities and other research organisations.

The State Government investment in CRCs generates over $19 million in cash and $20 million in-kind support every year. When added together this support provides over 220 companies with research and development services, employs around 265 people including more than 200 higher-degree researchers, and facilitates multiple international collaborations with countries such as China, Germany, UK, Canada, India, Spain and Japan.

Since its creation nationally, the CRC network has added $14.5 billion to the Australian economy — including some $8.58 billion of impacts already materialised and a further $5.87 billion of benefits estimated to occur between 2012 and 2017.\(^\text{18}\)

In South Australia the CRC for the Contamination and Remediation of the Environment is internationally recognised as a centre of excellence in environmental soil remediation. Headquartered at the University of South Australia’s Mawson Lakes campus, the CRC has 25 participants including the Environmental Protection Authority SA, VeruTK and Rio Tinto.

Technologies being developed by the CRC will enable the development of old industrial land, creating substantial economic benefits through direct savings in remediation costs, an increase in decontaminated land values, as well as improved health outcomes from cleaner food, land and water.

\(^\text{18}\) The Allen Consulting Group (July 2012), Final Report to the Department of Industry, Innovation, Science, Research and Tertiary Education on the economic, social and environmental impacts of the Cooperative Research Centres Program.
INDUSTRY
COLLABORATION,
ENTREPRENEURSHIP
AND
COMMERCIALISATION

Objective
To strengthen the links between education, research and industry to improve translating research into new products and services.

Why this is important
If we are to increase commercialisation and innovation we must strengthen the linkages between industry, research, education and markets. This is recognised as a key challenge.

Collaboration is the key to commercialisation and innovation. This often requires close links between researchers, industry and a good understanding of changing market demands and the ability to respond to these changes and bring new products and services quickly to market.

Approximately 10 per cent of innovations could not have happened without the support of academic research; and 20 per cent of private sector innovations are based to some extent on public-sector research19.

South Australia has a large number of small to medium sized businesses and the future growth of the economy will depend increasingly on uptake of new technologies by these firms.

Around 91 per cent of Australian businesses report a benefit from innovation, which can be as high as 97.6 per cent for large Australian businesses. These benefits include increased revenue, reduction in costs, gaining a competitive advantage and improved customer service20.

Strategies
1. Align more research within our universities to local industry challenges by working with industry to identify and communicate these challenges to universities.
2. Support innovation in industry through increased investment in management capability and the establishment of innovation clusters.
3. Support research students at university to commercialise new ideas or gain industry-based research experience.
4. Seek to attract more venture capital to South Australia to support commercialisation opportunities for local companies and research institutions.
5. Enable greater release of data and information held by government to the community to encourage innovation.
6. Drive greater innovation within the State Government, particularly where it can assist in creating commercial opportunities for industry and improving services to the community.
Key actions/initiatives

In response to the recommendations of the Premier’s Science and Industry Council the State Government will:

- Jointly develop detailed plans for agreed actions between industry, universities and research institutes to establish improved research commercialisation services, in areas such as minerals, food, medical devices and energy.

- Establish the Student Entrepreneurial Initiative, in partnership with universities, to support STEM students with establishing new local business ventures and commercialising technologies that meet the needs of industry.

- Require all State Government agencies and key statutory authorities to develop innovation plans identifying areas where innovative approaches can improve service delivery and address emerging challenges. It is expected that these plans will include changes to procurement practices to support innovation and the commercialisation of research by local industry.

In addition the State Government will:

- Provide facilitation support to encourage the establishment of ‘early stage’ risk capital providers and venture capitalists in South Australia.

- Provide $750,000 over three years to expand the Flinders University’s Medical Device Partnering Program, which supports the development of hi-tech medical devices through collaboration between researchers, industry, consumers and government.

- Invest $3 million over the next three years in the Innovation Voucher Program. This Program offers up to $50,000 in funding for businesses to work with researchers to find innovative solutions through technical research, design development and prototyping.

- Work with our universities to develop a web based platform to better connect research activity with industry, support innovation and facilitate collaboration with industry. This initiative will be supported by the Innovation Voucher Program.

- Provide $3 million over three years for the Small Business Innovation Research pilot to support innovation in small and medium sized enterprises through strategic procurement practices by government.

The State Government has declared that it will proactively release data that holds potential economic, social and environmental benefits. The very successful Unleashed initiative, enabling digital entrepreneurs to use freely available public data in innovative ways, will continue to be supported. The Office of Science, Technology and Research will also promote to local businesses, commercial opportunities arising from the new Adelaide Wi-Fi network.

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Businesses are increasingly looking outside their organisation for new and innovative ideas to improve and expand their products, services and production processes.

Tindo Solar Group designs and manufactures technologically advanced, premium quality solar photovoltaic modules from its plant at Mawson Lakes. Through the use of advanced robotics Tindo Solar is able to produce a quality product at affordable prices.

Tindo Solar received funding through the Innovation Voucher Program to collaborate with researchers at the University of South Australia to develop two new technologies.

The first project is at the frontier of renewable energy technologies and aims to integrate a lightweight-metal air battery using a different chemical composition into Tindo’s existing solar panels.

Integrating battery storage on a grid connected solar system will enable solar energy generated during the day to be used at night.

The second project aims to improve the operating efficiency of Tindo’s solar panels by designing and incorporating an optical filter to absorb the infrared part of the solar spectrum. Absorbing infrared light will mean a reduction in solar-cell temperatures, resulting in more energy being produced for each solar panel.
CASE STUDY
UNLEASHED AND MEGA

Unleashed and MEGA are two examples of the growing interest in new technologies, particularly in the development of applications with a public benefit or commercial potential.

In 2013, 105 South Australians participated in Unleashed, an open data competition that enabled government agencies to explore the possibilities of data they manage on behalf of the community. It involved working with digital entrepreneurs to design projects to bring long term benefit to the community through the release of selected public data sets.

The winning entries demonstrated the huge potential of government stored open data. These included a mobile app to assist students explore career pathways in the mining sector, a web-based analytics tool for improving children’s wellbeing, and a lifestyle app to help users organise group exercise activities.

The MEGA digital entrepreneurship masterclass is aimed at mobile, digital content or ICT companies looking to develop new mobile apps and services. Through a 20 week industry-led education program, digital entrepreneurs are supported by industry mentors to develop creative, technical and business skills. The masterclass culminates in a “Pitch Day”, where participants pitch their idea to a panel of national industry experts.
During the period 2002 to 2010 the number of Australian research publications doubled overall and, strikingly, the number of internationally co-authored publications more than tripled\(^2\). This is evidence of the growing importance placed on global research collaboration.

Strengthening existing partnerships and building new relationships particularly with global leaders in industry and research will be important in encouraging increased trade and investment. Developing these relationships in our region with growing economies such as China and India is especially critical.

**Why this is important**

Collaboration enables researchers to stay at the forefront of new knowledge and techniques. Collaboration also enables our researchers to access complementary research capabilities and infrastructure that may not be available locally.

Most importantly, research collaboration works to increase the global impact of local research and maximise the economic, social, health and environmental benefits for South Australians.

Australia produces just over 3 per cent of the global research outputs based on the number of academic papers published\(^2\). While this is high for a country with a relatively small population, it shows that the majority of research is being conducted elsewhere. South Australia will need to maintain productive research partnerships with the world’s leading research and industry centres to ensure our researchers have access to the most relevant and up to date information from around the world.

During the period 2002 to 2010 the number of Australian research publications doubled overall and, strikingly, the number of internationally co-authored publications more than tripled\(^2\). This is evidence of the growing importance placed on global research collaboration.

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\(^2\) Science Watch – Annual Ranking of the Top 20 countries according to the research output and citation performers 2000, accessed Aug 31 2010.

Strategies

1. Promote the research capabilities of our universities and research organisations to attract international investment and create opportunities for local industry.

2. Support collaborative research between our universities and research organisations and international research partners to address shared challenges and build our reputation and scientific capability.

3. Promote South Australia as a premium destination for international students looking to undertake STEM related study.

Key actions/initiatives

In response to the recommendations of the Premier’s Science and Industry Council, the State Government will:

- establish a coordinating committee to facilitate, support and provide advice on international research and industry opportunities in South Australia.
- expand the Premier’s Research and Industry Fund - International Research Grant Program to support new global research linkages, particularly in Asia, as well as those regions with world-leading capability in areas of strategic importance to the State.

The Office of Science, Technology and Research will also work with interested parties to:

- create opportunities for international STEM students who have graduated from local universities to stay and work in South Australia.
- in partnership with South Australia’s universities, research institutes and Invest in South Australia, prepare a prospectus of South Australia’s capabilities and expertise to promote and attract new investment into the State.
CASE STUDY
THE AUSTRALIAN CENTRE FOR PLANT FUNCTIONAL GENOMICS

The Australian Centre for Plant Functional Genomics (ACPFG) uses the latest genomic technologies to develop techniques for improving the resistance in cereal crops to environmental stresses such as drought, salinity, and nutrient deficiencies. This is particularly relevant for countries with similar environmental conditions to South Australia.

The Centre has around 170 staff and students, with 60 per cent from overseas. It has an excellent international reputation and has formed research partnerships with countries including India, China, and the Philippines as well as commercial collaborations.

Research services from the Centre are currently being provided to Dow AgroSciences in the United States for crop trials, the King Abdullah University of Science and Technology in Saudi Arabia, to develop crops able to grow in saline conditions, and DuPont in the United States to improve crop yields.

The State Government has contributed over $20 million to assist with the construction and operations of the Plant Genomics Centre building. From this contribution, it is estimated that the Centre has leveraged an additional $148 million with the majority of these funds expended in South Australia.

A Deloitte Access Economics report commissioned by the Australian Centre for Plant Functional Genomics predicted an increase in South Australia’s Gross State Product by $132 million and Gross Domestic Product of $1 billion a year by 2014-15, if technologies for drought resistance, salinity tolerance and nitrogen use reduction were commercialised.

23 Deloitte Access Economics (June 2011) Economic value of cereal technologies in Australia. Commissioned by the Australian Centre for Plant Functional Genomics Pty Ltd.
Laureate Professor John Ralston AO founded the Ian Wark Research Institute (The Wark™) at the University of South Australia in 1994, and was Director until his retirement in March 2012. Construction of The Wark’s first building was aided by a $1 million grant from the State Government. John was succeeded by Professor Magnus Nydén, a physical chemist from Sweden.

The Wark hosted the Australian Research Council (ARC) Special Research Centre for Particle and Material Interfaces between 2000-08, and headquartered the Australian Mineral Science Research Institute (AMSRI) between 2006-10. AMSRI represented a unique partnership between globally leading minerals scientists and industry.

The $26 million project funding, over five years, included an $8.6 million ARC Linkage grant together with State Government ($2.5 million), University ($1 million), and industry funding ($10 million). Professor William Skinner and Professor Jonas Addai-Mensah lead The Wark’s AMIRA P260 Flotation Project, now in its 25th year. Utilising infrastructure supported by the State Government, the project has resulted in a 22:1 return to industry over its lifetime, worth over $1 billion.

The South Australian Node of the Australian National Fabrication Facility, is located within The Wark and led by Professor Thomas Nann, with a focus on the fabrication of microfluidic ‘chips’ and similar devices. The $16 million facility was funded via Commonwealth, State Government, and University contributions from 2007 to present.

In 2012, a joint $50 million Commonwealth, State and University initiative resulted in the construction of the Materials and Minerals building with state-of-the-art research infrastructure. It also offers a place designed specifically to enhance the blending of the teaching and research environments, and industry engagement.

In January 2013, Professor Bart Follink joined The Wark as the South Australian Chair in Minerals Processing, a joint initiative between the State Government, Premier’s Research and Industry Fund - South Australian Research Fellowship ($1 million), and the University of South Australia ($1 million).
INVESTING IN SCIENCE

The considerable social and environmental benefits generated by public research are hard to quantify but the advances in medical science and improvements to health and longevity clearly demonstrate the benefits to society.

INCREASING WELLBEING THROUGH PUBLICLY FUNDED RESEARCH

Why this is important
Our investment in applied research is essential to maintain and improve our clean environment, good health, our well-being and overall standard of living. This has both economic and social benefits.

A conservative estimate of the State Government’s own direct investment in research is around $124 million in 2012-13. The majority of this funding is allocated towards applied research (57 per cent) with the balance being more basic research to support the environment, health sector, agriculture, fisheries and primary production.

The return to the Australian community in terms of health benefits from its $25 billion investment in health and medical research in the 15 years to 2006-07 is estimated to be around $54.2 billion. Further, Australian health research and development expenditure between 1992-93 and 2004-05 is estimated to have returned a net benefit of approximately $29.5 billion. That is, for every dollar invested in Australian health research and development, there is a return of over $2 in health benefits.

Objective
To sustain the State’s reputation as a leader in research conducted for the benefit of society.
Strategies

1. Sustain fundamental and applied clinical research into more effective health care.

2. Sustain fundamental and applied research into better understanding and sustainable use of the State’s natural resources including land, fresh water and marine ecosystems to provide security to South Australia’s food production systems and enable equitable resource use and wealth creation.

3. Develop institutional research and technical capabilities to support resource and energy intensive industries to lower costs and improve sustainability.

4. Increase the provision of expert technical and consulting services to overseas companies, universities and governments.

Key actions/Initiatives

The State Government will:

- Support investment in health and medical research in the State and strengthen South Australia’s reputation and international standing in health and medical research through the establishment of the South Australian Health and Medical Research Institute.

- Invest $200,000 to help establish the South Australian Renewable Energy Institute in 2014. The Institute is a partnership between the State Government, the University of South Australia and Flinders University, and will focus on challenges associated with intermittent renewable energy resources such as wind, solar and wave power.

- Help facilitate funding for commercialisation of technologies in health and biomedical sciences.

- Support implementation of South Australia’s Climate Change Adaptation Framework by Government, business and regional communities focusing on applying outcomes of research.

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24 This figure is based on the Australian Bureau of Statistics Government Expenditure of Research and Development survey. The $124 million is derived from the median of eight years of survey data between 2004-05 to 2011-12.

25 The Economic Value of Australia’s Investment in Health and Medical Research: Reinforcing the Evidence for Exceptional Returns, October (2010), a paper commissioned by Research Australia.
The South Australian Research and Development Institute (SARDI) works to secure a premium market position for South Australia’s food and primary industries.

The Institute delivers innovations and solutions for the ongoing economic growth of our primary industries, particularly to the Grains, Pigs, Poultry, Wine, and Fishing and Aquaculture industry sectors as well as to the Food and Nutrition cross sector.

It addresses issues of climate change, sustainable resource utilisation, and works to increase the safety standards of our agricultural products.

State Government investment has underpinned SARDI’s success in securing national and international grants, totalling on average $39 million per year. Over the next 10 years, the Institute’s research is projected to deliver primary industry market benefits in the order of $2.3 billion, at current investment levels. These benefits will continue to accrue as productivity gains to industry over several decades.

Through SARDI’s significant capability and strong industry partnerships, the State Government is providing industry with the opportunity to deliver on the growing demand in our region for our premium food and wine, underpinned by robust science.

The SARDI reports a return to rural industry of 55 per cent from its investment in research and development activities26.

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Approximately 1.5 million children die every year from dehydration caused by acute diarrhoea.

Professor Graeme Young, the 2013 South Australian Scientist of the Year and the Director of Development for Flinders Centre for Innovation in Cancer has led research which has discovered a simple and inexpensive approach to reducing the problems that acute diarrhoea causes.

As a consequence of this research, Professor Young is now a principal investigator on three projects, totalling $13.5 million from the world renowned Bill and Melinda Gates Foundation. This work is aimed at revising the World Health Organisation oral rehydration formula for use around the world and to develop recommendations for developing countries to reduce the burden of diarrhoeal disease.

Professor Young also has an impressive research track record in applying his findings in colorectal cancer prevention, particularly in understanding the effects of dietary components in protection against, and progress of colorectal cancer. It is Professor Young’s innovative work in the area of colorectal cancer screening that has led to technological advances in screening, improved uptake of screening and importantly the design and implementation of the National Bowel Cancer Screening Program.
INVESTING IN STRATEGIC INFRASTRUCTURE

Objective
To ensure South Australia’s science, research and innovation community has access to the equipment, facilities and infrastructure needed to undertake industry relevant research.

Why this is important
A major factor of Australia’s ability to undertake world-leading research is the availability and access to state of the art equipment, facilities and infrastructure.

Under the Commonwealth Government’s National Collaborative Research Infrastructure Scheme, South Australia invested nearly $22 million over five years to 2010-11 for 12 new facilities at South Australian universities and research institutes. This funding attracted around $28 million in Commonwealth funding and contributions from universities and industry in the order of $16 million.

Without access to modern research infrastructure and equipment, South Australia’s research and business communities will fall behind.

Our ability to attract world-leading researchers to South Australia depends not only on our intellectual capital but also access to world-class facilities and centres of excellence.

Strategies
1. In partnership with universities, research organisations and industry, continue to support the development of key ‘precincts’ to provide world-class facilities and equipment which are aligned to the State’s strengths and strategic priorities.

2. Promote the most effective use of existing infrastructure, facilities and equipment to support inter-disciplinary research and industry-researcher engagement.

3. In partnership with the Commonwealth Government, identify the State’s future research infrastructure needs.

4. In partnership with universities, research organisations and the private sector, develop a State-based research infrastructure plan to complement the national agenda.
Key actions/Initiatives

In response to the recommendations of the Premier’s Science and Industry Council, the State Government will:

- establish and maintain a proactive process to prioritise across government investment in major and shared use facilities, on a 3-5 year planning horizon.

The State Government is also providing:

- $1.4 million over five years to support the development of two entrepreneur and innovation hubs in Adelaide for young entrepreneurs.

The Office of Science, Technology and Research will also work with interested parties to:

- Provide information on major and shared use equipment and facilities currently available in South Australia.
- Partner with industry, universities and research institutes to enhance the awareness of technical and consulting services available in the State.
- Advocate for and assist with the attraction of major research infrastructure where linked with State Government strategic priorities.
The South Australian Health Precinct will be the largest health precinct in the southern hemisphere. It will stimulate medical, pharmaceutical, clinical and commercialisation outcomes by co-locating the New Royal Adelaide Hospital, South Australian Health and Medical Research Institute (SAHMRI), the University of Adelaide Integrated Clinical School and the University of South Australia’s Centre for Cancer Biology and Interprofessional Health Clinic.

The precinct will have numerous other residents including the CSIRO and linkages to the Flinders Medical Centre. It will bring together public infrastructure, research and industry capability, adding vibrancy to an area of the northern border of Adelaide’s CBD previously used as rail yards. Upon completion the precinct will provide employment for more than 8,000 staff and accommodate 6,000 students.

Co-locating these organisations and their expertise will help to attract private sector investment in health services, medical devices and pharmaceutical industries.

SAHMRI’s research directions will centre on bioscience, clinical research and drug and device discovery, health services research, population health and health and social policy research, and nurse education.

It will house cutting-edge technology such as South Australia’s first Cyclotron, which will contribute to improved health outcomes for cancer patients, and address the growing scope for Positron Emission Tomography diagnostic cancer research.
IMPLEMENTATION

The implementation of this action plan rests with State Government agencies working together with industry, research organisations and the wider community. Agencies will be required to develop an innovation plan and annual progress reports on actions implementing Investing in Science.
The Chief Scientist and Premier’s Science and Industry Council will oversee the implementation of Investing in Science and provide independent reports to the Premier and Minister on the outcomes achieved and status and effectiveness of actions on at least an annual basis.

An extra $2 million a year will be allocated to the Premier’s Research and Industry Fund to fund the expansion of initiatives that were recommended by the Council.

The Science Technology Engineering and Maths Executive Reference Group, currently chaired by Raymond Spencer, Chair of the Economic Development Board, will be responsible for overseeing the STEM actions and providing independent advice to the Premier and Minister on the implementation of initiatives.

The Office of Science Technology and Research within the Department of Further Education, Employment, Science and Technology will be responsible for the coordination and where appropriate implementation of actions in the plan and the reporting on progress.

This Action Plan will be the subject of an annual report to Government, including reference to relevant South Australian Strategic Plan targets.
## Resources

This table shows an estimate of the state resources only, with the expectation that for some initiatives they will be part of industry or research institute joint resourcing.

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<tbody>
<tr>
<td>Premier’s Research and Industry Fund existing funding</td>
<td>4,460,000</td>
<td>4,220,000</td>
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<tr>
<td>Premier’s Research and Industry Fund additional funding(^1)</td>
<td></td>
<td>1,000,000</td>
<td>2,000,000</td>
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<td>Whole of government R&amp;D (internal)(^2)</td>
<td>123,922,500</td>
<td>123,922,500</td>
<td>127,020,563</td>
<td>130,196,077</td>
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<td>Skills for All - STEM in VET(^3)</td>
<td>25,400,000</td>
<td>26,700,000</td>
<td>28,000,000</td>
<td>29,400,000</td>
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<td>Defence scholarships</td>
<td>350,000</td>
<td>375,000</td>
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<td>Digital Productivity(^4)</td>
<td>454,000</td>
<td>435,000</td>
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<td>Adelaide WiFi</td>
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<td>1,550,000</td>
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<td>Science Communication(^5)</td>
<td>779,000</td>
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<td>Cooperative Research Centre Assistance(^6)</td>
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<td>Education Investment Fund</td>
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<td>STEM Education Programs - DECD, PIRSA, DMITRE</td>
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<td>388,000</td>
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<td>Mining and Petroleum Services Centre of Excellence</td>
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<td>High-Value Food Manufacturing Hub (Food Hub)</td>
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<td>South Australian Health and Medical Research Institute (SAHMRI)</td>
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<td>Plan for Accelerated Exploration - Gawler Craton</td>
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<td>Small Business Innovation Research Pilot</td>
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<td>Hubs Adelaide</td>
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<tr>
<td>Student Entrepreneurial Initiative</td>
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<td>2013-14 Budget Commitments</td>
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<td><strong>Total</strong></td>
<td><strong>158,345,500</strong></td>
<td><strong>170,415,000</strong></td>
<td><strong>171,738,063</strong></td>
<td><strong>171,430,577</strong></td>
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1 Additional expenditure and DFEEST reprioritising of funds.

2 This figure is based on the Australian Bureau of Statistics Government Expenditure of Research and Development survey (ABS GovERD). The $123,922,500 in 2012-13 is derived from the median of eight years of survey data between 2004-05 to 2011-12, with 2.5 per cent CPI included from 2014-15.

3 Skills for All provides vocational education and training (VET) qualifications for priority STEM related courses such as electro-technology, electronics, and competitive manufacturing. This estimate is based on a 5 per cent growth per year over the period based on 2012-13 outcomes.

4 This includes programs such as Broadband SA, Fab Lab, and Digital Inclusion programs/projects.

5 Includes initiatives such as CSIRO Education, STEM Australia and the South Australian Science Excellence Awards.

6 Cooperative Research Centres also part funded by the Premier’s Research and Industry Fund.
Research compass

1. The University of Adelaide
   North Terrace Campus

2. University of South Australia
   City West and City East Campuses

3. University College London
   Australia and Carnegie Mellon University

4. Flinders University
   City Campus

5. West End Biomedical Precinct
   including South Australian Health and Medical Research Institute

6. Edinburgh Defence Precinct

7. Technology Park Adelaide

8. The University of Adelaide
   Roseworthy Campus

9. University of South Australia
   Mawson Lakes Campus

10. The University of Adelaide
    Waite Campus
    including headquarters for
    • South Australian Research and Development Institute
    • Australian Wine Research Institute

11. University of South Australia
    Magill Campus

12. Flinders University
    Bedford Park

13. Tonsley Campus
    • Sustainable Industries Education Centre
    • Flinders University

14. South Australian Aquatic Sciences Centre

15. Techport Australia

16. Thebarton Technology Precinct
    including
    • Bioinnovation SA
    • The University of Adelaide, Thebarton Campus

North East South West
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