www.csiro.au

# Annual Report 2013–14

## Big ideas start here

At CSIRO we shape the future. We do this by using science to solve real issues. Our research makes a difference to industry, people and the planet.

As Australia's national science organisation we are one of the largest and most diverse scientific organisations in the world. We have been at the forefront of science since 1926. Our people work closely with industry, governments and communities to leave a lasting legacy. Collectively, our innovation, excellence and collaborative approach places us in the top ten applied research agencies in the world.

We ask, we seek, we solve. We are CSIRO.

# values

Our Values guide our decisions and interactions with our colleagues and with our external partners and stakeholders. Our Values are symbolised through the CSIRO Values Compass:

- Embracing **scientific excellence** and working together ethically and with **integrity** in everything we do.
- Building **trust and respect** each day with our communities, partners and colleagues, knowing that with trust comes accountability.
- Igniting our **creative spirit**, exploring new horizons and creating an environment where innovation thrives.
- Consistently **delivering on our commitments**. 'Do what we say we will do'.
- Striving towards a **healthy, safe and sustainable** future.

## purpose

Our purpose is defined through the functions we undertake for the benefit of Australia, which are set down in the *Science and Industry Research Act 1949*. These primarily include:

- to carry out scientific research for the following purposes:
  - assisting Australian industry
  - furthering the interests of the Australian community
  - contributing to the achievement of Australian national objectives or the performance of the national and international responsibilities of the Commonwealth
  - any other purpose determined by the Minister
- to encourage or facilitate the application or utilisation of the results of such research.

## mission

We deliver innovative solutions for industry, society and the environment through great science.

## vision

Our science is used to make a profound and positive impact for the future of Australia and humanity.

**COVER:** Our impact stretches across society, providing innovative solutions that address major challenges, increase industry productivity and competitiveness, and help develop our cities, regional areas and nation as whole.

This report covers the financial year ended 30 June 2014.
It is also available on our website at **www.csiro.au/annualreport2014.**

www.csiro.au

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1st September 2014

The Hon Ian Macfarlane MP
Minister for Industry
Parliament House
CANBERRA ACT 2600

Dear Minister

We have pleasure in submitting to you, for presentation to Parliament, the sixty-sixth Annual Report of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) for the year ending 30 June 2014. This report has been prepared in accordance with the requirements of the *Science and Industry Research Act 1949 (SIR Act)* and in accordance with section 9 of the *Commonwealth Authorities and Companies Act 1997 (CAC Act)*.

Under section 9 of the CAC Act, CSIRO Board members are responsible for producing an Annual Report in accordance with the rules laid down in Schedule 1 of this Act, including a 'Report of Operations' prepared in accordance with the Finance Minister's Orders, as amended.

This report was endorsed for presentation to you at the meeting of the CSIRO Board members on 26 August 2014.

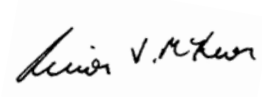
The report also includes an appendix comprising a report from the Chief Executive of CSIRO, as Trustee of the Science and Industry Endowment Fund (the Fund), established under the *Science and Industry Endowment Act 1926*, on the operations of the Fund together with a report by the Auditor-General on the accounts of the Fund.

The CAC Act requires CSIRO to report developments since the end of the financial year, giving particulars of any matter or circumstance that has arisen and has significantly affected or may significantly affect CSIRO's operations or state of affairs.

On 1 July 2014 CSIRO implemented a new organisational structure. This structure intensifies focus on three distinct lines of business Impact Science, National Facilities and Collections and CSIRO Services providing scientific advancements and innovative technological solutions for our industry and community. The structure will allow Australia to better leverage the opportunities of CSIRO's large-scale multidisciplinary applied research.

We commend the Organisation's achievements to you.

Yours sincerely,



Simon McKeon AO
Chairman of the CSIRO Board

Dr Megan Clark AC
Chief Executive of the CSIRO

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We ask. We seek.
We solve. We are CSIRO.

The world's first handheld 3D laser mapping system uses our Zebedee technology and is already being used by heritage, policing and mining industries in Australia and overseas, including the iconic Leaning Tower of Pisa.
Read more on page 73.

# Part 1 | Overview

Performing high-quality science that delivers results with relevance and impact across areas of importance for Australia, is what drives us each and every day.

Our governing and senior leaders share their views on the past year.

- Chairman's foreword | 2
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From blood tests for cancer to client satisfaction and staff safety, we are achieving great things.

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With over 50 locations our impact stretches across Australia and around the world.

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Our business units and executive leaders as at 30 June 2014.

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We have embarked on a major reform program, meeting our first milestone on 1 July 2014.

- Preparing for our greatest transformation | 12

# Foreword

## By the Chairman

As a critical nation-building organisation, CSIRO continues to make the decisions required for it to anticipate and meet the many and varied challenges Australia faces. This approach means that, through scientific and technological advancements and working with industry on matters of national interest, CSIRO is a foundation for the country's current and future prosperity.

The Board and I continue to be inspired by the women and men of CSIRO who work tirelessly to solve the big questions for our country. It is these scientists and support staff who are delivering on CSIRO's Strategy – collaborating with partners in Australia and overseas, creating opportunities for businesses small and large leading to more highly skilled employment possibilities, advising governments and maintaining a high global standing for quality science.

Above all, this talented CSIRO 'army' is dedicated to making life better, in so many ways, for all of us – and for the nation as a whole.

This drive and commitment to excellent science is central to the way CSIRO is structured. During the year, the Organisation delivered on its Operational Plan 2013-14 and introduced a new organisational structure which commenced in July 2014.

These changes coincided with a tight Federal Budget and, while we were plainly disappointed by the funding reductions, our plans to redesign CSIRO helped it respond promptly so we can continue to produce outstanding science and at the same time be financially sustainable. The planned structural changes reflect greater focus on our National Research Flagships Program and continue to build and enhance the development of nationally strategic scientific and technological advancements.

We also continue to assess our position in the global context and, just as many OECD countries demonstrated during the global financial crisis, encourage a commitment to investment in science and innovation as a key driver to national growth and productivity.

Through its National Research Flagships, CSIRO continues to develop deep collaboration and connections with fabulous partners in Australia and the world to complement our science capability and accelerate impact. During the year, we saw a 20 per cent increase in long-term partnerships, and have secured a pipeline of projects with the likes of BHP Billiton, Boeing, BP, Fonterra, General Electric, Newcrest Mining, Orica and Rio Tinto, to name but a few. CSIRO continues to be Australia's largest patent holder, with around 3500 patents and 650 inventions – with a quarter of these patents coming from collaborative work with external partners. We also launched the CSIRO Chile Research Foundation – the first legal entity to be launched by CSIRO outside of Australia. It will enable CSIRO to work with industry and its Chilean partners on issues of joint national significance to the mining industry, including safety, water and energy solutions.

A close connection must exist between research outcomes and how science is conducted. As a CSIRO core value, environmental sustainability will continue to be emphasised through improved work practices and a focus on efficient use of our physical infrastructure. The ongoing commitment to the environment and communities in which we operate is evident through the success of CSIRO's National Waste and Recycling Services programs and achievements of significant landfill waste reductions and cost savings in the current and previous financial periods. Environmental sustainability remains central, not just to CSIRO's research, but to its operation as an enterprise. In line with existing best practice in responsible management, we recognise environmental management as an important corporate priority and aim to be more environmentally sustainable in all operations.

**THROUGH SCIENTIFIC AND TECHNOLOGICAL ADVANCEMENTS AND WORKING WITH INDUSTRY ON MATTERS OF NATIONAL INTEREST, CSIRO IS A FOUNDATION FOR THE COUNTRY'S CURRENT AND FUTURE PROSPERITY.**

I would particularly like to congratulate all CSIRO individuals and teams (and our past CSIRO staff members) who received recognition through an impressive array of awards and honours throughout the year. You can see some of these acknowledgements on page 113.

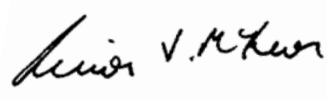
On behalf of the Board, I would also like to acknowledge the continued support of the Australian Government and our many research and commercial partners, as well as the many members of our advisory committees.

I welcome Dr Peter Riddles who joined the CSIRO Board during 2013–14 and is providing a valuable scientific perspective to its overall governance focus. I also acknowledge the valuable contribution made by Mary Boydell culminating in her important role as Chair of the Audit and Risk Committee of the Board. Mary retired from the Board in August 2014.

And along with the Board, I would also like to extend my deep and sincere appreciation to Dr Megan Clark for her unwavering dedication to CSIRO, particularly during the transformative change of the past year. Megan will end her term towards the end of 2014 and conclude a six-year period of outstanding service not only to CSIRO, but indeed to the nation itself. I am delighted that she was awarded a Companion of the Order of Australia during her last year with CSIRO.

And, finally, I would like to congratulate all our people, staff and management, for the many outstanding scientific achievements and excellent performance of the Organisation as a whole in 2013–14.

I am not a scientist. I have never created anything of any technical value. And aware of that shortcoming, I say 'thank you' to our people and Australia's science community generally on behalf of a nation which doesn't spend enough time acknowledging your extraordinary contribution.



**Simon McKeon AO**
Chairman of the CSIRO Board

# Chief Executive's report

This year has been extraordinary by any measure. Not only have we delivered on our Strategy and set new benchmarks for our science quality and impact, but we also embarked on our biggest transformational change of the last decade.

This is the third year of our 2011–15 Strategy and I am pleased that our strategic direction is delivering on our objectives. The strength of our Strategy is in the balance between adjusting to short-term conditions while investing strongly in the future through our people, science quality, infrastructure and long-term partnerships. In essence, our Strategy has helped differentiate CSIRO as a global leader for its essential role of delivering profound impact through excellent science and our increasing roles as connector and trusted advisor.

Our science quality has achieved new benchmarks as evidenced by our level of citations. We are equal or just above the best of Australian research-intensive universities in this metric.

One of the things I enjoy most is hearing about the incredible things our people do and seeing the gratitude on the faces of our partners. The work we do changes this nation and the world. We are changing people's lives, making our environment more sustainable, and creating new industries. In this report we share many of our science impacts, like bees with sensors, bushfire apps, new spin-out companies, prawn feeds, new sunscreens, water treatments, a cancer blood test, livestock transport optimisation, agricultural assessments and oil spill management – to name just a few.

We have made excellent progress delivering $650 million of new science infrastructure and precinct projects. We have completed the Marine National Facility's new research vessel, *Investigator*, which will arrive in Hobart in September. The Pawsey Centre supercomputer is in its final phase and is slated to be the most powerful supercomputer in the Southern Hemisphere. We launched the National Resource Sciences Precinct in Perth as well as the Victorian Centre for Sustainable Chemical Manufacturing at our Clayton Precinct. The Australian Square Kilometre Array Pathfinder produced its first survey data to the delight of the astronomy community.

We also completed the Sustainable Energy for the Square Kilometre Array project and National Geosequestration Lab in Western Australia. The *Atlas of Living Australia* reached two billion downloads, and we joined others in the new South Australian Health and Medical Research Institute building in Adelaide in what is shaping up to be a national medical precinct. And we commenced over $200 million investment in our Black Mountain and Clayton redevelopments that are central to our Precinct strategy.

Our collaborations and partnerships also deepened this year. We had a 20 per cent increase in our long-term industry partnerships and 13 per cent increase in active licensing of our technologies. We now work with 1200 Australian small and medium companies, 500 large Australian companies and 450 multinationals. Our collaborations are also growing. We work in 80 countries, and with 95 per cent of Australia's universities. Our number of collaborative publications has tripled since 2003 – joint publications with China increased eight-fold. This year we also established our first offshore legal entity, CSIRO Chile Research Foundation, to deliver solutions to the mining sector with approximately $100 million from the Chilean government over ten years.

## A MAJOR TRANSFORMATION

This year we began transforming the way we work; it is the next step in our strategic journey to be clear about our role as the pre-eminent agency delivering science focused on national challenges, and access to world-class facilities, plus quality services to industry. We merged our Divisions and Flagships and separated our National Facilities and Collections and Services into three lines of business. This lays the foundation for our future and our next decadal strategy.

## OUR PEOPLE AND VALUES

At the heart of our achievements and goals are our people. Every day I am humbled by their talent and creative spirit – we all share a desire to ensure our science is used to make a profound impact for the future of Australia and humanity. To our staff, I reinforce the responsibility of everyone in CSIRO to ensure the integrity of our excellent science, to build trust and respect each day, ignite our creative spirit, do what we say we will do and ensure everyone goes home safely and with a sense of pride.

We continued to focus on health and safety. This year 17 fewer staff suffered an injury serious enough to prevent them from coming to work compared to last year, resulting in a 28 per cent reduction in our lost time injury frequency rate. Our Independent Investigation into staff welfare by Professor Pearce highlighted that we needed to make a fundamental shift from dealing with staff health as an individual's issue to making it an organisational issue. We still have important work to do to make this fundamental shift, but we are on the right path and have committed to implement all recommendations of the investigation. We developed a five-year Wellbeing at Work Strategy to make sure we lead nationally in this area.

One area where we have not fully delivered on our objectives is diversity of our leaders, particularly our science and impact leadership areas. As we operate globally it continues to be important that CSIRO has some of the most experienced leaders at all levels drawn from around the world, from the best women and men in our sector, and our teams are vibrant, inclusive and leading performers. We have redoubled our efforts to nurture our pipeline of outstanding talent and provide them with the leadership skills and experiences to progress.

## A TRUE PRIVILEGE

I have had the outstanding privilege of leading one of the world's most respected applied research organisations over the last six years. CSIRO plays an essential role in providing the science and technology solutions to the biggest challenges and opportunities that impact our industries, communities and the future of our nation and the world. To be part of an organisation that realises this essential role has been a great honour.

CSIRO's success rests on its brilliant and dedicated people. I have been very fortunate to have had the opportunity to work with outstanding teams and people at CSIRO and the talent and commitment to the nation is truly humbling. I would like to thank all our staff and partners for their commitment and efforts and for their contribution to CSIRO's success. I will leave CSIRO knowing it is well positioned for the future and will continue to provide an essential role to the nation through its next stage of development. I will dedicate my time later in 2014 to introduce the new Chief Executive to our people and partners to ensure he or she is successful in leading CSIRO to new heights.

**Dr Megan Clark AC**
Chief Executive of the CSIRO

# Highlights of 2013–14

Every year, everyone in CSIRO works hard, works passionately to contribute to our mission to deliver innovative solutions for industry, society and the environment. This year was no exception, for at CSIRO… big ideas start here.

## INFRASTRUCTURE

**NATIONAL RESOURCE SCIENCES PRECINCT** LAUNCHED ON 8 APRIL 2014 – A PRECINCT OF NATIONAL AND GLOBAL IMPORTANCE.

**1ST IMAGE SUCCESSFULLY CAPTURED** BY ASKAP AT TWICE THE SPEED OF COMPARABLE TELESCOPES.

AUSTRALIA'S NEXT-GENERATION MARINE NATIONAL FACILITY ***INVESTIGATOR*** COMPLETED.

**2 BILLION DOWNLOADS** REACHED BY *ATLAS OF LIVING AUSTRALIA*.

**30,514 SPECIMENS** FROM OUR NATIONAL BIOLOGICAL COLLECTIONS DISPATCHED TO AID RESEARCH.

DELIVERY OF THE **PAWSEY CENTRE SUPERCOMPUTER**, WHICH IS LIKELY TO BECOME THE MOST POWERFUL IN THE SOUTHERN HEMISPHERE.

## SCIENCE IMPACT

12-month immunity confirmed for Equivac® HeV – the world's first horse vaccine against the deadly Hendra virus.

Our OptiCOOL technology now installed in around 1.4 million square metres of buildings (Australia and United States).

1st commercial vehicle installation of our UltraBattery, which is 70% cheaper to make.

Broad spectrum sunscreen under development that mimics the natural sunscreen of coral.

Third *State of the Climate Report* released with Bureau of Meteorology.

New colorectal cancer test to launch nationally.

## ENGAGEMENT & CONNECTIONS

- 8.6/10. Our customers rate us highly stating our client service, science excellence and quality of work.
- We worked with 1200 Australian SMEs, 500 big Australian companies and 450 multinationals this year alone.
- Our Education Centres shared science with 366,305 school students.
- 20% increase in our long-term partnerships.
- 26 Researcher in Business partnerships. 100th project conducted in 2014.
- We worked with 37 of the 39 Australian universities.
- We remain the biggest participant in the CRC Program – we're currently active in 20.

## EXCELLENCE

- Our citation rate places us in the top two amongst our global peers and 47% better than the global average.
- Network analysis shows CSIRO to be the most important institution in the country in the six fields in which we publish our most work.
- 26% of our patent portfolio is commercially licensed.
- 30% of our 644 patent families are the result of collaborative activity – 64% industry partners.
- We're in the top 1% in 14 research fields globally.

## SUSTAINABILITY

- 9694m$^3$ diverted from landfill; that's 998 tonnes of carbon emissions saved.
- 6 million air kilometres saved as part of our Carbon Emission Reduction Strategy.

## STAFF & CULTURE

- 28% reduction in staff injuries requiring time off work.
- 4855 development days delivered through our learning and development curriculum – 18% increase on last year.
- 69 Indigenous employees – up 16 on last year.

These are just some of our achievements from 2013–14. Many more are provided throughout this report.

# Our locations and global impact

Since 1926, we've sought to make a difference, to solve problems that matter to Australia and the world, and generate positive impact for today and tomorrow. In 2013–14 we've continued this legacy. Here are just some examples of our international impacts.

### NORTH AMERICA

Licensed our lithium-ion battery electrolytes technology to accelerate its optimisation for energy storage solutions.

645 10

### CONNECTED

Our connections with international universities and research institutes link us to the 97% of research that happens outside Australia.

- JOINT PUBLICATIONS
- MOUs
- ADVANCED MATERIALS
- AGRICULTURE
- BIOSECURITY
- CLIMATE VARIABILITY
- ENERGY
- ENVIRONMENT
- FISHERIES
- FOOD
- FORESTRY
- ICT
- MANUFACTURING
- MINING
- WATER

### CHILE

Established our first offshore legal entity, CSIRO Chile Research Foundation, to deliver solutions to the mining, equipment and services sectors.

34 3

**WE'RE ALSO WORKING IN AFRICA, THE MIDDLE EAST, LATIN AMERICA, SOUTH KOREA, AND THE PACIFIC IN AREAS SUCH AS AGRICULTURE, ASTRONOMY, CLIMATE VARIABILITY, ENERGY, FISHERIES, FOOD, MINING, OCEANOGRAPHY, AND WATER.**

### EUROPE

World's first industrial-scale pilot plant for applying extrusion porosification technology. CSIRO lab in Montpellier, France.

764 9

### CHINA

Licensee produced 1000 tonnes of Novacq™ prawn feed for start of commercial prawn trials.

345 22

### JAPAN

Achieved first commercial vehicle installation of our UltraBattery – available in Honda's Odyssey.

113 9

### SOUTH ASIA

Providing technical advice and data to support regional water management in Pakistan.

56 3

### SOUTH-EAST ASIA

Helping develop new high-resolution climate projections for Vietnam's next update of national climate scenarios.

98 5

### INDONESIA

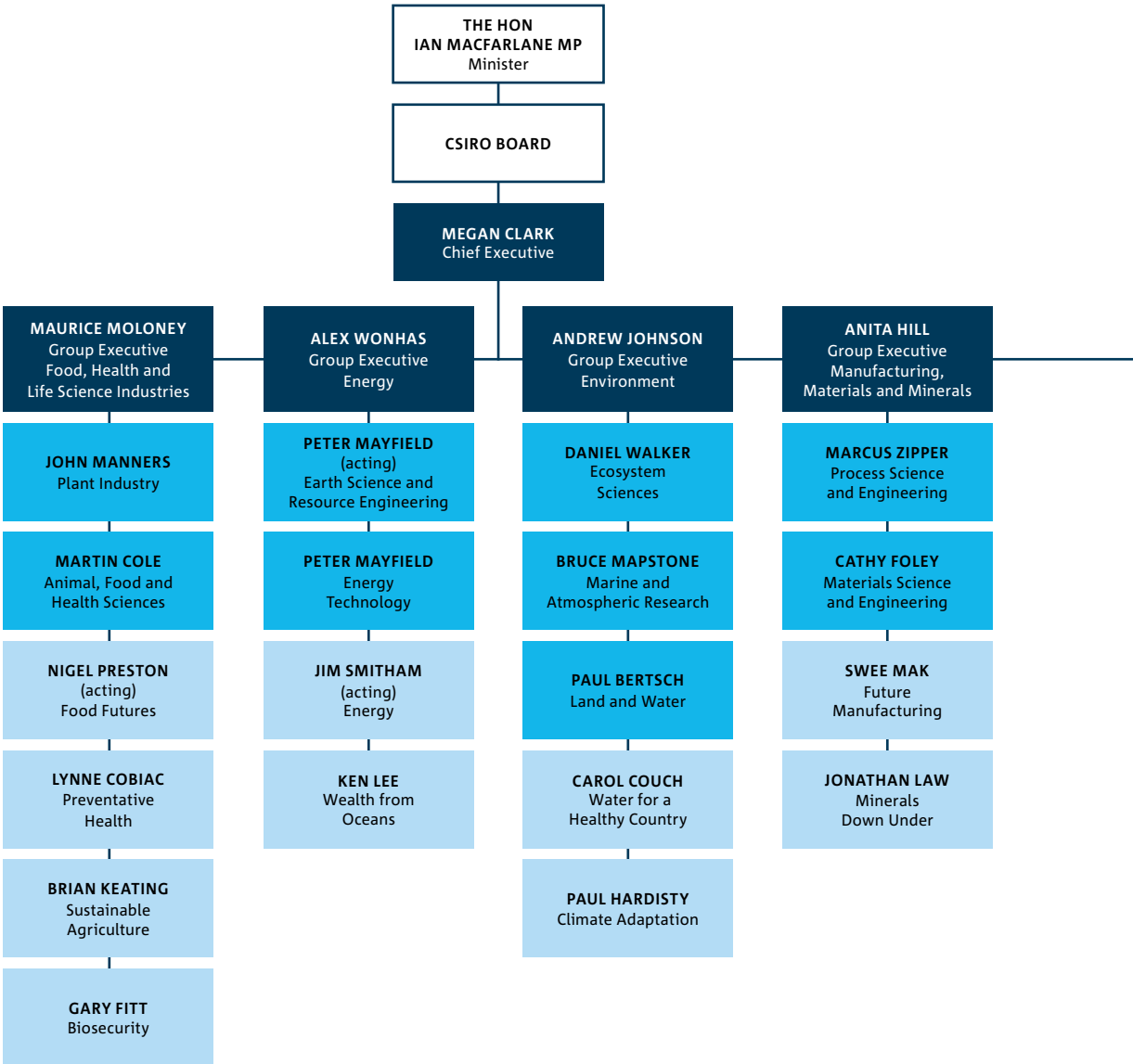
Helping Indonesia improve its biosecurity systems and together we're managing pelagic fisheries stocks shared by both countries.

17 2

A full list of CSIRO locations is available on page 196.

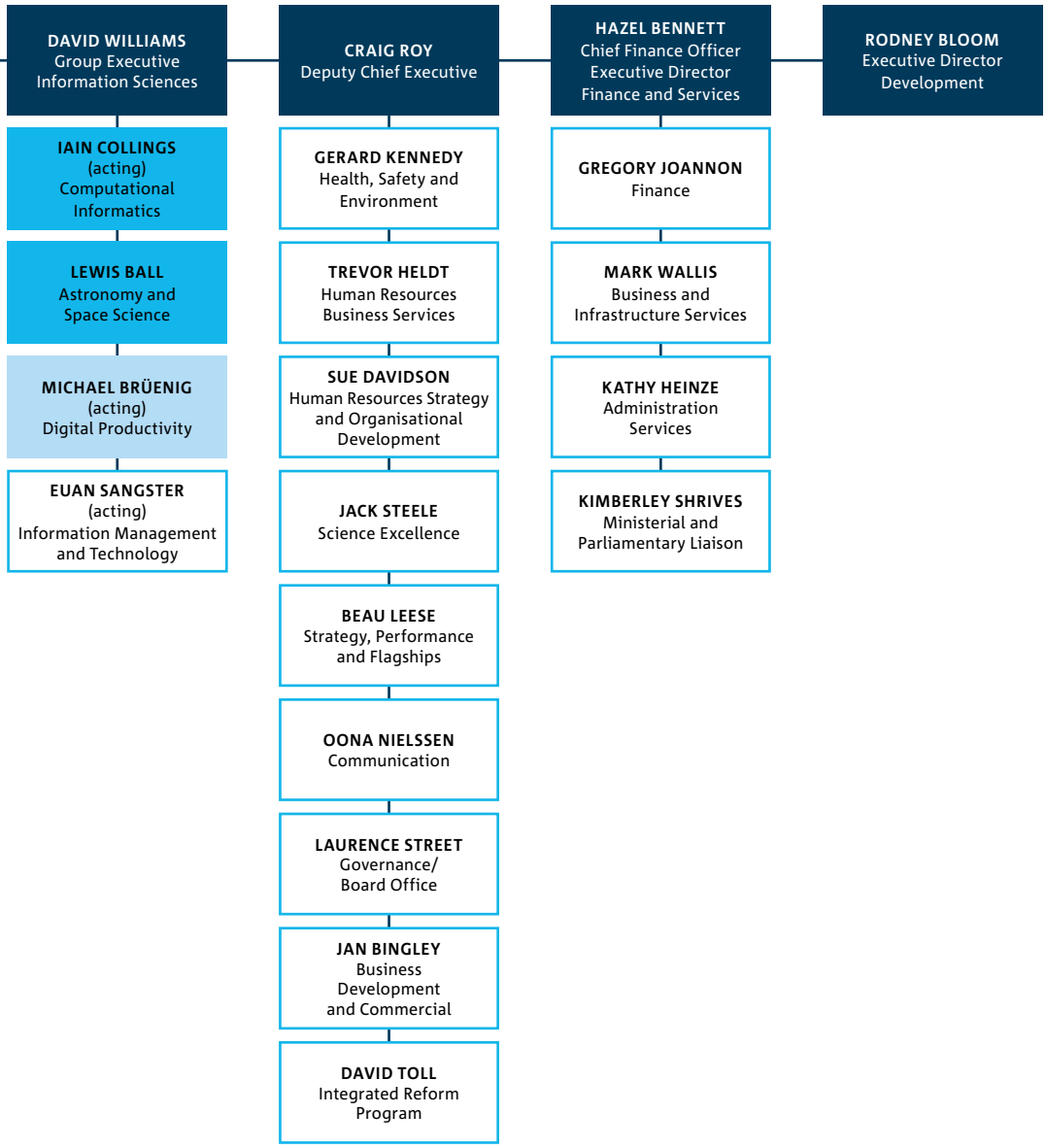
# Our organisational structure

## AS AT 30 JUNE 2014




During the year we reviewed our operating model in preparation for what will be the most significant transformation in our recent history to take effect on 1 July 2014. An overview of this work is on pages 12–13.

- ACCOUNTABILITY AND GOVERNANCE
- EXECUTIVE TEAM MEMBER
- CHIEF OF DIVISION
- FLAGSHIP DIRECTOR
- ENTERPRISE SERVICES LEADER



# Preparing for our greatest transformation

We have been one of Australia's critical nation-building organisations for nearly 90 years and we've done that by foreseeing and stepping up to challenges. We are determined to continue this legacy.

Throughout the 2013–14 period, we reviewed our staff wellbeing, operating arrangements and financial sustainability in response to feedback from our people and external partners and stakeholders. As a result our CSIRO Board approved an Integrated Reform Program centred on:

- a new structure for the Organisation focusing on lines of business
- a targeted set of measures to ensure financial sustainability and a balanced budget for the next four years
- a multi-level administrative project to transform business processes
- a comprehensive staff wellbeing program.

These changes will see us enhance the way we work, improve staff wellbeing, deliver greater value to the nation, better serve our customers and partners and strengthen our sustainability and global competitiveness as one of the top ten applied research agencies in the world.

These lines of business recognise distinct contributions, ensuring a more agile, effective, efficient and easy to deal with CSIRO for our client and partners.

We're proud to be a trusted advisor to government, industry and the community and we will continue to perform this role.

Our new operating model will improve our ability to focus and deliver on the biggest challenges facing Australia and the world around us.

## NATIONAL FACILITIES AND COLLECTIONS

**Infrastructure and biological collections managed by CSIRO for the benefit of research and industry.**

- We will be the pre-eminent manager of national facilities.
- We will provide efficient, effective use of scientific infrastructure and collections to the wider community.

## IMPACT SCIENCE

**Nine National Research Flagships with a focus on the biggest challenges facing the nation.**

- We're combining the capability of our 11 Divisions and the impact-focus of our 11 Flagships into nine National Research Flagships.
- Our Flagships will integrate capability development through to science delivery.
- Flagships will continue to be an effective vehicle for mobilising multidisciplinary capability and scientific research to address critical issues like the nexus of energy, food, land and water.

## CSIRO SERVICES

**Commercial, customer-centric products and services for industry, government and the community.**

- We will deliver more efficient, customer-focused services to business, government, education, research and the community.
- We will enhance Australia's position as a leader in R&D commercialisation.
- We will provide an entrepreneurial, lower cost, lower overhead service.


Tiny sensors are providing valuable information on honey bees which contribute between $4 and $6 billion to the Australian economy annually via their free pollination service. Read more on page 37.

# Part 2 | Our performance

As a trusted advisor on the big issues facing the nation, CSIRO and its people continue to play a key role in Australia's productivity and competitiveness.

A high-level summary of how we monitor our performance.



Our performance against the planned activities within our four-year Strategy.



Our collaborations with clients, partners and stakeholders around the world are critical to our success.



Our performance against the deliverables and key performance indicators as agreed to with Government.

## Measuring our performance

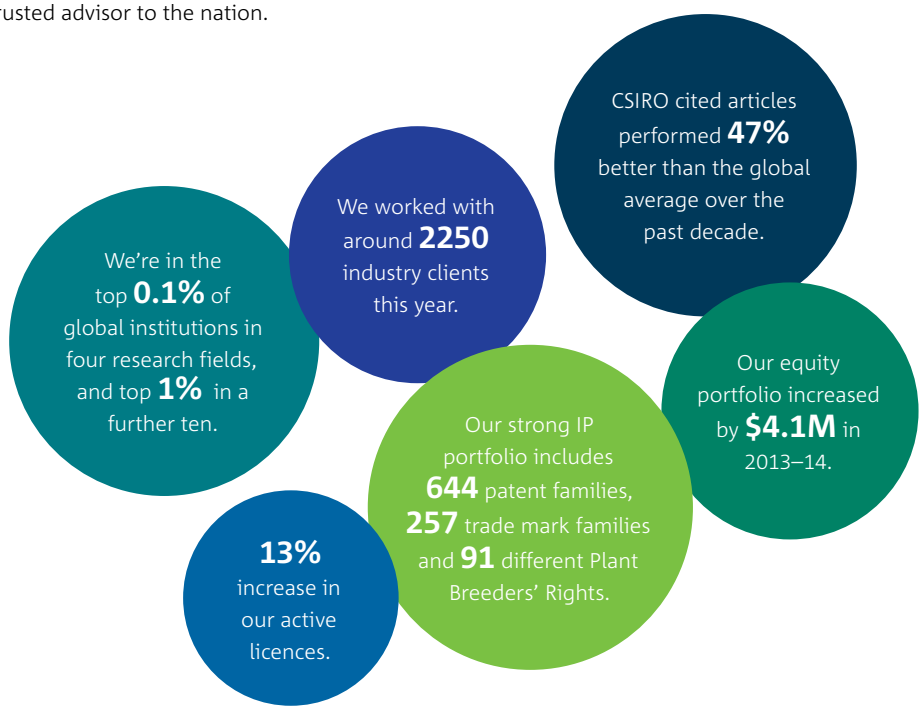
CSIRO continues to play an important role in Australia's National Innovation System. Consistent with our responsibilities outlined in the *Science and Industry Research Act 1949,* we aim to deliver innovative solutions for industry, society and the environment, and to see our science be used to make a profound and positive impact for the future of Australia and humanity.

Our combination of size, breadth and depth in capability, active research portfolio management and expertise in conducting large-scale, multidisciplinary, mission-directed research is unique. We are a leader in addressing major challenges that matter to Australia's future, including the complex interactions of human activity with the natural and built environments. This unique position enables us to act as:

- a connector and key collaborator across the innovation system, to help Australia gain access to global knowledge
- a manager of research capabilities and facilities that are critical for national preparedness to better understand national challenges and opportunities and support national priorities
- a trusted advisor to the nation.

The activities and achievements outlined in this section of our annual report provide evidence of our performance against our 2013–14 Operational Plan and the 2013–14 Portfolio Budget Statements. In addition to this report to Parliament, we also monitor our performance throughout the year by providing:

- regular reports to the CSIRO Executive Team and Board to assist with their decision-making and governance responsibilities
- detailed planning and review processes operating at a range of levels, including Flagships, functional areas and individuals.



## Financial performance

In 2013–14, CSIRO delivered a deficit from ongoing operations of $25.7 million. Total revenue of $1,244.9 million included appropriation from government of $778.2 million and $466.7 million in revenue generated from other sources.

**TABLE 2.1: CSIRO'S FINANCIAL PERFORMANCE BY SOURCE OF REVENUE, $M**

| REVENUE SOURCE | 2009–10 | 2010–11 | 2011–12 | 2012–13 | 2013–14 |
|---|---|---|---|---|---|
| **Co-investment, consulting and services** | | | | | |
| Australian private sector | 61.0 | 65.0 | 74.2 | 70.1 | 78.5 |
| Australian Governments | 189.3 | 202.7 | 201.8 | 190.3 | 179.3 |
| Rural Industry R&D corporations | 33.5 | 37.7 | 35.0 | 38.4 | 50.2 |
| Cooperative Research Centres | 38.8 | 32.3 | 30.0 | 16.9 | 14.7 |
| Overseas entities and international | 71.6 | 74.5 | 77.5 | 84.3 | 84.7 |
| Work in progress / deferred revenue | -13.6 | 5.9 | -7.6 | 25.1 | - 13.0 |
| **Total co-investment, consulting and services** | **380.4** | **418.1** | **410.9** | **425.1** | **394.4** |
| Intellectual property – royalty and licence revenues | 46.7 | 29.2 | 278.5 | 37.5 | 29.1 |
| **Total research and services revenue** | **427.1** | **447.3** | **689.4** | **462.6** | **423.5** |
| Other external revenue | 28.2 | 47.9 | 61.3 | 44.1 | 43.2 |
| Gains on sale of assets | 3.9 | 4.9 | 0.4 | 0.0 | - |
| Other fair value gains and reversals | - | 0.1 | - | 5.5 | - |
| **Total external revenue** | **459.2** | **500.2** | **751.1** | **512.2** | **466.7** |
| Revenue from Government | 704.9 | 720.4 | 724.9 | 733.8 | 778.2 |
| **Total revenue** | **1,164.1** | **1,220.6** | **1,476.0** | **1,246.0** | **1,244.9** |
| Less expenses | 1,333.1 | 1,231.1 | 1,275.5 | 1,267.5 | 1,270.6 |
| **Operating result** | **-169.0** | **-10.5** | **200.5** | **-21.5** | **- 25.7** |

## Strategy progress

Our CSIRO 2011–15 Strategy is underpinned by five strategic pillars:

1. National Research Flagships
2. Science Excellence and Preparedness
3. Deep Collaboration and Connection
4. Innovation Organisation
5. Trusted Advisor.

Our 2013–14 Operational Plan[1] and 2013–14 Portfolio Budget Statements[2] respond to our Strategy, providing an overview of the priorities, programs, change initiatives and other key activities to be undertaken, along with the resources to implement these, during the third year of our Strategy.

### OPERATIONAL PLAN

*Performance assessment against annual Key Executive Actions*

Our 2013–14 Operational Plan identified eight Key Executive Actions to progress our CSIRO Strategy. These actions are designed to focus our Board and Executive Team's attention on the Organisation's most important priorities for the year.

An overview of the results achieved for these actions is provided below.

**Pillar 1: National Research Flagships**

Focus and increase the Organisation's resources invested in delivering profound impact in response to national challenges and opportunities through the National Research Flagships program.

### Flagship consolidation

a. **Finalise the successful formation and/or integration of our Digital Productivity and Services, Biosecurity, Energy and Future Manufacturing Flagships.**
b. **Clarify our enterprise Health strategy, particularly the nexus between health, nutrition and food, and reposition the Preventative Health Flagship accordingly.**
c. **Clarify the future of Divisional Themes and their intersection with Flagships in the CSIRO Divisions of Marine and Atmospheric Research, Plant Industry, Ecosystem Sciences, and Animal, Food and Health Sciences.**

The Digital Productivity and Services, Biosecurity, Energy and Future Manufacturing Flagships achieved their formation and integration expectations during the year. Aligned Themes were successfully consolidated and will be further embedded as our new Flagship structures are embedded through 2014–15.

We clarified our positioning in health through our 2014–15 CSIRO Annual Directions Statement and structural changes to our Flagships. The merger of our Food Futures and Preventative Health Flagships into a new Food and Nutrition Flagship from 1 July 2014 brings together capability to address the nexus of food, health and nutrition.

The consolidation of Divisional Themes and their intersection with Flagships has been completed through our structural reform, which merged our Divisions and Flagships into nine Flagships from 1 July 2014.

For more information about Flagship achievements see pages 30–57.

**Pillar 2: Science Excellence and Preparedness**

Invest in people and infrastructure to maintain and develop national scientific breadth and depth in support of delivering profound impact and scientific preparedness.

### Science platforms

**All CSIRO Divisions have approved individual plans to deliver the Flagship future capability requirements, including infrastructure, sites, collaborations, workforce, HSE and future science platforms, underpinned by Capability Development Funds and Transformational Capability Platforms; and to finalise the merger of CSIRO Mathematics and Informatics and Statistics and Information Communications Technology (ICT) Centre.**

1 CSIRO's Operational Plan is available at: www.csiro.au/operational-plan.
2 CSIRO's Portfolio Budget Statement is available at: www.industry.gov.au.

During the year a number of Divisions further developed their Divisional Plans. In April 2014, the CSIRO Board decided to defer this action to 2014–15 in light of the introduction of our new operating model on 1 July 2014 where Divisions and Flagships are merged into new Flagship entities.

In 2013–14, the merger of CSIRO Mathematics and Informatics and Statistics and ICT Centre into the new Division of CSIRO Computational and Informatics was successfully finalised and became fully operational.

## Global Precincts

**Execute activities in line with the Executive Team endorsed action plan for each of CSIRO's Global Precincts, including the realisation of stakeholder commitments, managing the interface with the Industry Innovation Precincts program, CSIRO's capital plan and our national connector role.**

During 2013–14, CSIRO's Global Precincts progressed satisfactorily, achieving a number of milestones. Progress of the Canberra, Clayton (Victoria) and Perth Precincts in particular was solid, including:

- the outcome of the Public Works Committee hearing for Black Mountain and Clayton was supported through the Senate
- opening of the National Resource Sciences Precinct in Perth on 8 April 2014 by the Hon Ian Macfarlane MP, Minister for Industry
- opening of the Victorian Centre for Sustainable Chemical Manufacturing on 26 July 2013 by the Hon David Hodgett, Minister for Manufacturing (Victoria) at DuluxGroup in the Clayton Precinct
- opening of the New Horizons Centre on 30 July 2013 by Senator the Hon Kim Carr (then Minister for Innovation, Industry, Science and Research) at the Australian Manufacturing and Materials Precinct in Clayton.

For more information about results from CSIRO's science standing see the Enterprise Strategy Measures on pages 22–25.

**Pillar 3: Deep Collaboration and Connection**

Build deep connections with and among the best partners in Australia and the world to complement our science capability and accelerate impact delivery.

## Long-term partnerships

**a. Increase the total value of long-term strategic partnership agreements with industry by 20 per cent.**

**b. Enhance engagement with small to medium enterprises (SMEs) through doubling the number of Researcher in Business placements.**

**c. Increase the number of active licences by 15 per cent.**

Despite a difficult economic climate during 2013–14, we continued to strengthen our industry partnerships and alliances, securing a solid pipeline of projects for 2014–15. In addition to maintaining strategic alliances with organisations such as Boeing, General Electric and BP, we also entered into new long-term agreements, including a five-year strategic agreement with Fonterra to drive innovation in sustainable farming, manufacturing, health, nutrition and consumer dairy products.

During 2013–14, our engagement with SMEs also expanded, with 26 Researcher in Business projects, compared with 16 in 2012–13. This fell short of our target of 32 placements due to resourcing constraints and the identification of leads from within the Organisation.

The number of patent and Plant Breeders' Rights families subject to an active licence as at 30 June 2014 was 288, a 13 per cent increase for the year. Despite falling slightly short of the targeted 15 per cent increase, this outcome represents a significant improvement in the uptake and adoption of CSIRO licences over a 12-month period. The number of licences generating income, which include the licensing of copyright as well as registered intellectual property (IP), is 348 held by 290 unique licencees. For details of our IP portfolio see page 59.

## Major Projects

**Deliver major infrastructure projects (including Australian Square Kilometre Array Pathfinder (ASKAP), Pawsey Centre, ACT Site Consolidation, National Geosequestration Laboratory, Sustainable Energy for the Square Kilometre Array (SESKA) Geothermal, and Marine National Facility Future Research Vessel) as per approved project plans and in line with CSIRO Major Project Standards.**

Overall, major projects have progressed satisfactorily during the year, in line with CSIRO Major Project Standards. Highlights include:

- Our new ASKAP antennas at the Murchison Radio-astronomy Observatory are designed to be a high-speed survey instrument with high-dynamic range. The real-time computer 'Galaxy' is now live and operational. Recent test images validate ASKAP's design and demonstrated ASKAP's power in superior survey speed, remarkable dynamic range and extraordinary sensitivity.
- The Pawsey Centre, a joint venture between CSIRO and the four Western Australian universities, is likely to become the most powerful supercomputing centre in the Southern Hemisphere. During 2013–14, the Pawsey Project delivered a supercomputer under budget with acceptance testing scheduled to be completed by 30 August 2014.
- Delivery of the Marine National Facility Future Research Vessel *Investigator* was delayed. The ship is expected in September 2014. CSIRO successfully secured funding from government to support operations of *Investigator* for 180 days at sea per year.
- The ACT Site Consolidation Project is now fully operational, with our CSIRO Board approving the commencement of the construction phase from 30 April 2014. Combining Phases 1 and 2 is expected to accelerate the project by 16 to 20 months.
- All components of the SESKA Geothermal Project are now fully operational. The groundwater cooling system has been the primary source of cooling for the Pawsey Centre since November 2013. The cooling system has also been integrated with the Pawsey Centre building management system.
- The National Geosequestration Laboratory Project has progressed well and on budget, with completion expected in October 2014.

**RECENT TEST IMAGES VALIDATE ASKAP'S DESIGN AND DEMONSTRATED ASKAP'S POWER IN SUPERIOR SURVEY SPEED, REMARKABLE DYNAMIC RANGE AND EXTRAORDINARY SENSITIVITY.**

**Pillar 4: Innovation Organisation**

Boost our capacity to operate as one organisation to respond to the changing nature of science, deliver profound impact and build capability for the future.

## Enabling impact

**Plan and commence a five-year action plan to lift our organisational capacity to accelerate impact delivery, as measured against the enterprise innovation maturity model, with the focus in FY2013–14 on:**

**a. Commencing delivery of an integrated five-year plan (in consultation with Comcare) to equip all of our people to foster inclusion, trust, respect in a diverse and Zero Harm culture.**

**b. Plan and commence a coordinated program of transformational improvements of our operational arrangements, business practices and supporting systems, leading to significant cost reductions and productivity gains.**

**c. Lift the maturity of Flagship impact management – planning, monitoring, evaluation and communication – based on CSIRO Impact Project methodology, particularly to inform portfolio investment decision-making.**

An integrated five-year 'Wellbeing at Work' 2014–18 Strategy was signed off by the CSIRO Board in December 2013. The Strategy, endorsed by Comcare's Centre of Excellence, incorporates focus areas identified in the Independent Investigation's General Findings Reports[3]. Delivery against key strategic initiatives across all strategy pillars began in early 2014. Notable response areas included wellbeing education and development of our people and leaders in fostering inclusion, trust, respect in a diverse and Zero Harm culture.

Through our Integrated Reform Program significant progress on transformational improvements to our operational arrangements has begun. Establishing the Program and delivering the first milestone in a decadal reform took less than six months. It included successfully defining and recruiting key science and support roles into the new operating model, and undertaking workshops with over 120 staff from across the Organisation to identify system and process issues for improvement.

Flagship impact management activities progressed successfully and included the development of an enterprise impact framework with supporting guidelines for planning, monitoring and evaluating impact, as well as governance protocols to ensure consistency across the Organisation. All Flagships – including newly formed Flagships and those Themes transitioning from Portfolios to Flagships – have, for the first time, developed impact statements and articulated their future impact pipeline. See the Impact Enterprise Strategy Measures on pages 22–23 for more detail.

## Financial sustainability

**Develop (in consultation with Government) and execute plans to address the medium to long-term financial sustainability of CSIRO.**

We have clarified and continue to deliver on pathways for achieving financial sustainability. Plans are in place to reduce management and support costs as well as general operating expenses during 2014–15 through our Integrated Reform Program. Continued delivery of our site consolidation strategy is helping to contain increases in property costs. We have responded to the tough budget environment by a focused reduction in some science areas and have developed a balanced four-year budget that improves overall financial sustainability to better enable future growth.

**Pillar 5: Trusted Advisor**

Play a leading role in the trusted delivery of scientific evidence, advice and interpretation to the Australian government, public and industry.

## CSIRO 2015–25 Strategy

**Develop and progress a robust CSIRO 2015–25 Strategy, Lapsing Program Review, and positioning for a successful Quadrennial Funding Agreement process in FY2014–15, including engagement with parliamentary, government, industry and community stakeholders.**

Development of our 2015–25 Strategy progressed ahead of schedule, including agreement on nine key strategy choices and supporting strategy blueprint. The schedule for completion has been modified to accommodate an incoming Chief Executive.

CSIRO will not undertake a formal lapsing program review in light of the Commission of Audit and clarity on future funding from Government. As input to our 2015–25 Strategy development process, an assessment of our performance against our existing strategy is being developed.

We have engaged closely with Government to clarify and confirm future funding arrangements, including changes to our 2014–15 Portfolio Budget Statements to better reflect our operations and role in the National Innovation System.

For more details on stakeholder engagement see pages 27–28.

3 See page 111 for information on the Independent Investigation.

## ENTERPRISE STRATEGY MEASURES

At CSIRO, we adopt a number of mechanisms to monitor overall progress against our strategy, including reporting against ten Enterprise Strategy Measures (ESMs). These measures are designed to provide evidence of our performance across four dimensions critical to the success of our CSIRO 2011–15 Strategy.


A summary of actions taken and progress achieved against our ESMs is provided below.

### Impact

**Develop measures in 2011–12 for delivery of triple-bottom-line[4] impact through evaluating realised benefits. Be recognised as one of the top three global applied science organisations by 2014–15 for impact delivery as measured against our 20 global peers[5].**

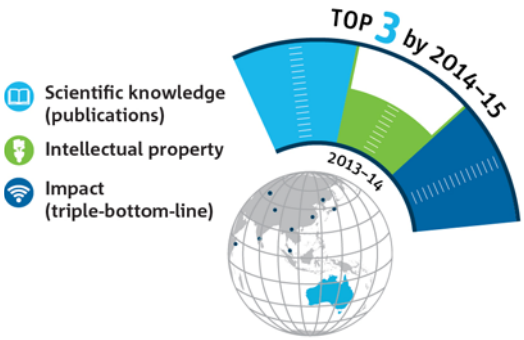
When compared against relevant science excellence and impact-related performance dimensions, CSIRO is within the top ten applied research organisations in the world. Achievements in a combination of citations, intellectual property and triple-bottom-line impact indicate we could reach the top three of applied science organisations globally by 2014–15 (see Figure 2.1).

In terms of our science impact and scientific knowledge, our Science Health and Excellence Reports[6] suggest we are performing as well as or better than most of our global peers (top three). Analysis of Normalised Citation Impact indicates we maintained our rank of second[7] for a second year in a row. In terms of scale and reach, our delivery of scientific solutions that contribute to significant economic, environmental and social impact for Australia, also places us in the top three. An analysis of patent filings registered in the World Intellectual Property Database indicates we have not yet reached the top three, but are ranked within the top ten amongst our global peers. We were however still Australia's largest patent holder in 2013 (644 patent families) with 30 to 40 per cent of our patent families the result of collaborative activity with external parties.

Evidence of our impact is demonstrated in the achievements in Program 1 – National Research Flagships. See pages 30–57.

**IN TERMS OF SCALE AND REACH, OUR DELIVERY OF SCIENTIFIC SOLUTIONS THAT CONTRIBUTE TO SIGNIFICANT ECONOMIC, ENVIRONMENTAL AND SOCIAL IMPACT FOR AUSTRALIA PLACES US IN THE TOP THREE WHEN COMPARED WITH GLOBAL PEERS.**

**FIGURE 2.1: CSIRO IMPACT COMPARED WITH 20 GLOBAL PEERS**




4 Triple-bottom-line refers to economic, social and environmental impacts.
5 Refer to Glossary on page 199 for a listing of the 20 global peers used in this comparison.
6 CSIRO's Science Health and Excellence Reports are available at: www.csiro.au/ScienceHealthandExcellence2012-13
7 Analysis involves a combination of normalised citation measures from Thomson Reuters InCites, Scimago's Institution Ranking and calculations based on Web of Science data and uses the new Crown Indicator methodology. Refer to Glossary on page 199.

**Develop future impact pipelines for at least 80 per cent of the Flagship Portfolio by June 2012. Evaluate potential triple-bottom-line value for at least 50 per cent of the Flagship future pipeline by June 2013 and 80 per cent by June 2014. Deliver Flagships' goals at a rate meeting or exceeding initial time-to-goal expectations.**

For the first time, all Flagships have consistently articulated their future impact pipeline, including an assessment of intended triple-bottom-line value, using impact statements and reflecting the growing use of our impact framework. The information collected continues to grow in relevance and uptake within Flagships, informing business development activities, science investment planning and communication. These impact commitments will be further reviewed and refined by the nine new Flagships over the next year as part of their planning processes and will include time-to-goal commitments against which performance will be monitored.

**Baseline customers' willingness to recommend in 2011–12 and improve our performance year-on-year over the Strategy.**

Our Listening to Clients online survey is conducted on projects delivered to our clients. The survey asks clients to rate their 'willingness to recommend' CSIRO on a scale of 0–10, and provide reasons for their score.

For the second consecutive year, we received high satisfaction ratings from clients, recording an average 8.6 out of 10. The top three reasons were: client service, science excellence and quality of work. The survey results provide valuable insight on our performance and inform improvements to our client engagement initiatives, business processes and services, such as timeliness, communication and cost.

**Increase community awareness of impact derived from CSIRO activities from the established baseline of 50 per cent in 2010–11 to 75 per cent by 2014–15.**

In 2011, 40 per cent of Australians questioned in an online survey were able to name at least one contribution they believed CSIRO had made to their lives. In 2013, in focus group interviews, 38 per cent were able to name a positive contribution they believed CSIRO had made to their lives. Responses by different segments of the community have been attributed to their different levels of receptiveness to science information[8]. During 2013–14, CSIRO did not undertake a comparable survey to assess the trend of community awareness of impact derived from CSIRO activities.

In February 2014, the Australian National University (ANU)[9] and Inspiring Australia commissioned a national survey, 'How do Australians engage with science', canvassing 1020 adult Australians on public engagement in science and technology, including trusted sources of scientific information in Australia.

The preliminary findings indicate a relatively high number of respondents trusted CSIRO in both aspects:

- At 12 per cent, CSIRO was the most commonly mentioned trusted source of accurate information about science (equal to friends and family).
- Scientists were rated as the most trusted groups of people to explain the impacts of scientific or technological advances. The most trusted of the different groups was well known scientists such as Nobel Prize winners or Australians of the Year (82 per cent), followed by CSIRO scientists (78 per cent).

8 The segments that have identified an interest in science (i.e. segments 1: passive interest in science; 2: actively interested in science; and 3: interested but confused by scientific information) represent those community members who are more engaged in science and consequently more likely to be able to respond with knowledge of a positive contribution by CSIRO to their lives. Whereas the segments identified as not really interested (i.e. segments 4: not really interested in science; 5: not interested at all in science and do not much trust it; and 6: not interested in science and feel they know enough already, represent those members of the community that are less interested in science and consequently less likely to be able to respond with any knowledge of impact derived by a CSIRO activity to their lives.

9 National Survey Results – 'How do Australians engage with science'; Study commissioned by 'Inspiring Australia' for Australian National Centre for the Public Awareness of Science; The Australian National University, April 2014.

## Science

**Science quality is maintained or improved in Environment-Ecology, Agricultural Sciences, Plant and Animal Sciences and Geosciences as measured through benchmarking against global peers (science productivity, citations per paper, collaboration). CSIRO maintains breadth in at least 14 fields in the top one per cent globally based on ISI/Thomson Reuters total citation data.**

CSIRO is ranked in the top 0.1 per cent of global institutions in Plant and Animal Sciences, Agricultural Sciences, Environment and Ecology and Geosciences (based on total citations). In addition, we rank in the top one per cent globally in a further ten research fields. This number decreased from 15 last year to 14 this year[10].

Overall, our citation impact has consistently improved over the last decade with CSIRO articles cited performing 47 per cent better than the global average for the period 2009–13. In 2013, performance for the period 2008–12 was reported as 56 per cent better than the world average. The apparent drop is due entirely to a complete overhaul of the baselines the data provider requires to generate the metric. When measured using the new baselines, our 2008–12 performance was 41 per cent better than world average, meaning our 2009–13 performance is a six per cent improvement.

Further, when comparing all articles of the same type and in the same subject for the period 2009–13 (based on percentile performance), 2.8 per cent of CSIRO publications were in the top one per cent of articles globally, 10.2 per cent in the top five per cent and 18.1 per cent in the top ten per cent. This is an improvement across all three levels since 2008–12. These results demonstrate our science excellence and outputs are highly competitive against global peers.

For more information on our publication output and citation impact see Program 2 pages 62–64.

**WE ARE IN THE TOP 0.1% OF GLOBAL INSTITUTIONS IN FOUR RESEARCH FIELDS.**

**Progress towards establishing precincts of global standing in the Plant and Agricultural Sciences, Resource Sciences, Environmental Sciences, Materials and Manufacturing Sciences and Human Life Sciences meets Precinct Development Plans by 2014–15.**

The developing Global Precincts are strengthening their core relationships with key partners and broadening their stakeholder engagement. We achieved a number of milestones this year, including progress on the Black Mountain (Canberra), Clayton (Victoria) and Perth Precincts.

The Government supported recommendations by the Public Works Committee for redevelopment and enhancement of property at both our Black Mountain and Clayton sites, and the National Resource Sciences Precinct in Perth was officially launched on 8 April 2014 by the Hon Ian Macfarlane MP, Minister for Industry. The ANU–CSIRO science vision for the Canberra Precinct is being developed to include Transformational Agriculture. Broader plans for an 'Innovation Campus' are under discussion.

For more information on our Precinct Program see page 19.

## People

**No fatalities or major injuries of CSIRO people. Lost time injury frequency rate (LTIFR)[11] and medical treatment injury frequency rate (MTIFR)[12] improves year-on-year and is in the top quartile of like organisations by 2014–15.**

During the past year more of our staff went home safely compared to previous years, with 17 fewer staff than in 2012–13[13] experiencing a lost work day injury, a 28 per cent reduction. The LTIFR for 2013–14 was 3.4 compared with 4.7 for 2012–13. The number of incidents required to be reported to Comcare was down 30 per cent from 2012–13.

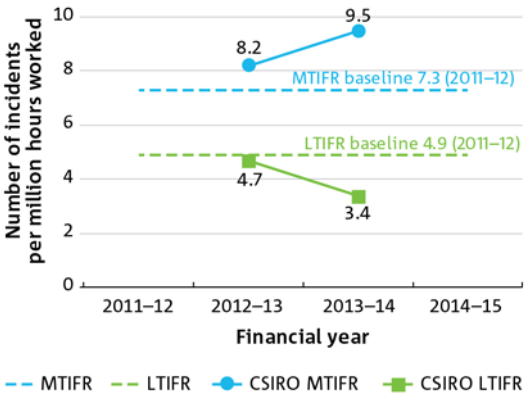
Initiatives encouraging our people to report early body stressing injuries before they develop into more disabling injuries are leading to a decrease in lost time injuries and an increase in medical treatment injuries. This frequency rate will also decline over time as the underlying injury causes are addressed. The MTIFR for 2013–14 was 9.5 compared with 8.2 the previous year, reflecting the focus on early injury intervention and reporting (see Figure 2.2).

10 Fundamental changes in the way the data provider assembles its rankings saw CSIRO drop out of the Physics ranking in 2013–14.
11 LTIFR is the number of incidents involving lost time from work greater than or equal to one full day or shift per million hours worked.
12 MTIFR is the number of incidents requiring medical treatment (beyond first aid) per million hours worked.
13 Historical data presented in this report may differ from previous reports due to delayed reporting and reclassifications. Every effort has been made to ensure the data presented is the most accurate available at the time of reporting.

**28%** REDUCTION IN STAFF INJURIES THAT REQUIRED TIME OFF WORK.

For more information on our health and safety programs see pages 104–105.

**FIGURE 2.2: CSIRO LOST TIME AND MEDICAL TREATMENT FREQUENCY RATES**




**Awareness of CSIRO's Values increases year-on-year from the established baseline of 73 per cent in 2010–11 to 95 per cent in 2014–15.**

Awareness of our CSIRO Values was 71 per cent in 2010 and raised from 81 per cent in 2012 to 87 per cent in 2014. In 2013–14, we intensely focused our efforts on the application of our Values, largely driven by our decision to commission an independent (Emeritus Professor Dennis Pearce AO) investigation into allegations of workplace bullying and other unreasonable behaviour, and our acceptance of all recommendations from the investigation's General Findings Reports 1 and 2.

We also conducted two cultural surveys during this period: 'Speaking Up in CSIRO' (2013) and 'CSIRO Staff Welfare' (2014). Both of these surveys were referenced in the General Findings Report 2. Specifically, the Independent Investigator stated that the survey *'findings are promising and indicative of CSIRO's early to mid-stage maturity in the strategic management of staff welfare—a longer-term commitment to which is evident through successive enterprise strategies and plans, a cooperative agreement with Comcare, a focus on the Code of Conduct and Values, and ongoing cultural work across CSIRO. Overall, the findings offer support for the recent focused effort on staff welfare and provide valuable information about how best to enable further improvements across different work groups in CSIRO'.* To read our Values see page ii.

## Resources

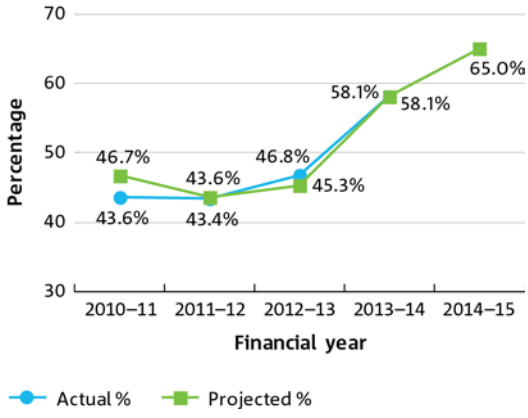
**CSIRO's financial, operating and capital management performance meets approved annual budget.**

During the year, CSIRO's operating, capital and cash positions were constantly monitored and managed to achieve the budgeted financial outcomes. CSIRO delivered a deficit operating result of $25.7 million for the year which was within the Board approved annual budget and the loss position approved by Government. CSIRO did not fully spend its planned capital budget due to unforeseen events impacting three major projects – delays in delivery of the new research vessel for the Marine National Facility; reduced scope of the SESKA project with the cancellation of the deep well given successful completion of groundwater cooling for the Pawsey Centre; and re-phasing of work on the National Geosequestration Lab.

**Allocation of CSIRO (Consolidated) resources to the National Flagships increases to 65 per cent by 2014–15.**

Allocation of CSIRO (Consolidated) resources to the National Research Flagships was on budget at 58 per cent for the 2013–14 financial year (see Figure 2.3).

**FIGURE 2.3: ALLOCATION OF CSIRO (CONSOLIDATED) RESOURCES TO THE NATIONAL RESEARCH FLAGSHIPS[14]**




14 All figures are based on CSIRO consolidated results.

# Listening to our clients

We work with clients of all sizes, from small companies to large multinationals, applying our scientific expertise to their challenges and opportunities to help them grow and succeed. Here is just a glimpse of what our clients think about working with us.

- *The work performed was outstanding. It provided us with science and insight so that we can better make our business decisions. We are certainly happy to further collaborate with CSIRO and strongly recommend CSIRO to others.*

  **LIHIULAB ENERGY TECHNOLOGY CO LTD**

- *Very satisfactory project execution. Sound technical and valuable advice. A previous project had led to us wanting to work with CSIRO again and this was a perfect opportunity, hopefully there is more to come.*

  **ORBITAL AUSTRALIA PTY LTD**

- *Outstanding support and professional approach and personal understanding with CSIRO research partner.*

  **UNIVERSITY OF NEW SOUTH WALES**

- *CSIRO's involvement in the project provides science credibility to project outcomes.*

  **AUSTRALIAN BUREAU OF AGRICULTURAL AND RESOURCE ECONOMICS & SCIENCES (ABARES)**

- *CSIRO is also a very trustworthy and reliable agency to work with – being able to say that our testing was conducted by a reputable organisation helps in the credibility of what we claim.*

  **ASPEN NUTRITIONALS AUSTRALIA PTY LTD**

- *CSIRO is client focused. They are always willing to assist in solving problems that arise during testing and offer very useful advice on test procedures.*

  **YUANDA AUSTRALIA PTY LTD**

- *Great partnership through constant engagement and communication.*

  **THE BOEING COMPANY INC**

- *The quality of the project work is excellent and relevant.*

  **DIVING AUSTRALIA INC**

- *CSIRO were able to provide expert knowledge and advice to ensure the success of the project.*

  **YBE (2) PTY LTD**

- *Good technical know-how. Robust project management capabilities. Customer focused.*

  **PETRONAS CARIGALI SDN BHD**

- *Unique technical expertise.*

  **HAMERSLEY IRON ORE PTY LTD**

- *Staff from CSIRO are very cooperative and give us tremendous support which is out of our expectation.*

  **ORICA AUSTRALIA PTY LTD**

- *Work was done on time, on budget, technically all correct. Happy customer!*

  **APELON INC**

- *Experience is probably the most important asset in my mind – it means that R&D projects are efficient in terms of not reinventing the wheel simply to bring the research providers up to speed, and that appropriate research methodology is recommended and employed from day one.*

  **WOOL INDUSTRY RESEARCH LIMITED**

- *Pragmatic research backed by sound evidence, good practice and transparent methodology.*

  **GLNG OPERATIONS PTY LTD**

## Stakeholder engagement

We continue to build and maintain strong relationships with our customers, partners and other stakeholders crucial to our success.

### INDUSTRY COLLABORATION

We work with some of Australia's and the world's leading organisations, including through major strategic alliances with General Electric, Boeing, Orica and Petronas. In 2013–14 we increased the value of our engagement with industry by ten per cent, with most of this growth coming from Australian private sector companies. We work with approximately 2250 industry clients, including 500 major Australian companies, more than 1200 Australian SMEs and more than 400 overseas corporations.

In 2013–14, we expanded existing research alliances in the gas sector. For example, Shell joined as an industry partner to the Western Australia Energy Research Alliance, which brings together CSIRO, Curtin University and the University of Western Australia. Other existing industry partnerships include Woodside Energy Ltd, Chevron Australia Pty Ltd and CGGVeritas. See Customer satisfaction and engagement on page 34.

**IN 2013–14 WE INCREASED THE VALUE OF OUR ENGAGEMENT WITH INDUSTRY BY TEN PER CENT, WITH MOST OF THIS GROWTH COMING FROM AUSTRALIAN PRIVATE SECTOR COMPANIES.**

### COOPERATIVE RESEARCH CENTRES (CRCS)

We engage in CRCs to build critical mass in research that tackle clearly articulated major challenges for end-users. We remain the largest single participant in the CRC program. Throughout the life of the program, over 200 CRCs have been established with 40 operating in 2013–14. CSIRO has participated in 139 CRCs and during the 2013–14 reporting period contributed to 20. Our direct contribution to CRCs in 2013–14 was $11.5 million.

### GOVERNMENT ENGAGEMENT

Throughout 2013–14, we had regular meetings with Ministers, parliamentarians and senior staff from relevant government departments to listen to their needs, share our research activities, and provide scientific information and advice to inform policy development and program implementation and evaluation. This included contributing to the development of the White Papers on Energy, Northern Australia and Agriculture. Our staff also participated on the Australian Research Committee.

CSIRO made ten submissions to Federal Parliamentary inquiries and our staff attended seven hearings to provide further evidence. We also held two 'Science for Breakfast' briefings at Parliament House for parliamentarians and their staff. Briefings covered natural disasters (October 2013) and the Future of Manufacturing (March 2014).

### UNIVERSITY COLLABORATION

We partner with universities to complement our science capability and accelerate impact delivery. In 2013, we undertook various collaborations with 37 of the 39 universities across Australia to conduct research projects, co-author research publications, undertake joint supervision of students and/or support adjunct appointments. Specifically in 2013–14, a number of major projects with Australian universities commenced. These included:

- With Deakin University we officially opened the new Biosecure Immunology Laboratory, located at the Australian Animal Health Laboratory (AAHL) in Geelong.
- With Monash University we formed the CSIRO–Monash Superannuation Research Cluster to address some of the big challenges in managing Australia's multi-billion dollar superannuation system.
- With multiple universities, we launched the Wealth from Waste Cluster. It focuses on 'mining' above ground resources – the metals contained in collections of discarded manufactured products and consumer goods. Partner universities include: The University of Technology Sydney, Monash University, The University of Queensland, Swinburne University of Technology and Yale University (USA).

## INTERNATIONAL COLLABORATION

Our international engagement provides economic, social and environmental benefits to the nation. Our connections with international universities and research institutes link us in to the 97 per cent of research that happens outside Australia and allow access to essential data and expertise. By partnering with SMEs and major global companies such as Boeing and Bayer, we provide opportunities for Australian industry to join global value chains. Our science supports Australian foreign policy and trade agendas, including poverty alleviation and improving market access for Australian exporters and trading partners, particularly in Asia.

We continue to grow our international activities and their impact. For more information about our collaborations, alliances and partnerships with our global peers see our Operational Plan implementation on pages 18–21 and our global impact on pages 8–9.

**OUR CONNECTIONS WITH INTERNATIONAL UNIVERSITIES AND RESEARCH INSTITUTES LINK US IN TO THE 97 PER CENT OF RESEARCH THAT HAPPENS OUTSIDE AUSTRALIA, AND ALLOW ACCESS TO ESSENTIAL DATA AND EXPERTISE.**

## INDIGENOUS ENGAGEMENT STRATEGY

Our Office of Indigenous Engagement continued to implement our CSIRO Indigenous Engagement Strategy. As a result, we now have 69 Indigenous employees within CSIRO – an increase of 16 on 2012–13. Of these, there are 16 cadets, 17 trainees, three PhDs, and one Postdoctoral researcher.

We engage Indigenous Australians across a broad range of areas, such as marine science, microbiology, environmental science, human resources, property services, astronomy and space science, information management and technology, forestry, mining, cotton, high performance crops, horticulture and aquaculture – to name but a few. In this way, Indigenous Australians are contributing to the science impact and research of CSIRO and to the productivity and sustainability of Australian industry.

**INDIGENOUS AUSTRALIANS ARE CONTRIBUTING TO THE SCIENCE IMPACT AND RESEARCH OF CSIRO AND TO THE PRODUCTIVITY AND SUSTAINABILITY OF AUSTRALIAN INDUSTRY.**

CSIRO has Indigenous representation on high-level advisory committees such as the Minerals Resources Advisory Council, CSIRO Human Research Ethics Committee and the newly-formed Indigenous Strategic Advisory Council.

More than 400 staff across research, support and leadership areas, have now participated in the 'Seeing through both eyes' program – an interactive course aimed at increasing cultural understanding and Indigenous awareness. This year sessions were held in Perth, Sydney, Adelaide, Brisbane and Canberra. The program has been effective in opening up more cadetships, traineeships and employment positions, by encouraging participants to think about how they might contribute to achieving Indigenous employment targets in their respective business units.

This year saw the inaugural Deadly Scientist of the Year Award presented to ethno-botanist Gerry Turpin. CSIRO initiated this award as part of the prestigious Indigenous Deadly Awards, a national Indigenous competition promoting excellence in the arts, health, community development, and now science.

For information on our engagement with the general public see Program 3 on pages 76–82.

## Performance of Portfolio Budget Programs

CSIRO received approximately 63 per cent of its operating revenue in appropriation funding from the Commonwealth Budget. Our commitment to the Parliament and people of Australia, set out in the 2013–14 Portfolio Budget Statements (PBS), is to contribute to the following outcome[15]:

*Innovative scientific and technological solutions to national challenges and opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.*

Fundamental to this outcome is our focus on:

- maintaining science excellence
- establishing strong connections with top global research and technology peers
- enhancing industry alliances through Flagships to actively encourage the application and adoption of our research
- building, maintaining and making available research infrastructure, including national scientific facilities and collections
- actively fostering collaboration with other parts of the National Innovation System, including other publically funded research agencies and universities
- promoting and supporting the science sector by supervising undergraduate and postgraduate students, conducting science education programs for school students and teachers and raising community awareness of our activities and science.

This is achieved through five Programs:

1. National Research Flagships
2. Core Research and Services
3. Science Outreach: Education and Scientific Publishing
4. National Research Infrastructure: National Facilities and Collections
5. Science and Industry Endowment Fund

The following sections provide a report against the deliverables and key performance indicators specified for each Program in the PBS. Table 2.2 outlines a summary of our consolidated financial performance by PBS Program.

**TABLE 2.2: CSIRO (CONSOLIDATED) FINANCIAL SUMMARY BY PBS PROGRAM 2013–14, $M**

| | ACTUAL | PBS BUDGET | VARIANCE |
|---|---|---|---|
| Government revenue | 778.2 | 757.1 | 21.1 |
| External revenue | 461.3 | 491.8 | -30.5 |
| **Total revenue** | **1,239.5** | **1,248.9** | **-9.4** |
| Program 1 (National Research Flagships) | 745.8 | 755.9 | -10.1 |
| Program 2 (Core Research and Services) | 327.6 | 332.1 | -4.5 |
| Program 3 (Science Outreach: Education and Scientific Publishing) | 34.1 | 34.6 | -0.5 |
| Program 4 (National Research Infrastructure: National Facilities and Collections) | 152.0 | 154.1 | -2.1 |
| Program 5 (Science and Industry Endowment Fund) | 23.7 | 23.3 | 0.4 |
| **Total expenses** | **1,283.2** | **1,300.0** | **-16.8** |

15 The relevant section of the Portfolio Budget Statements can be viewed at: www.industry.gov.au. The outcome is the formal legal statement of the purpose for which funds are appropriated to CSIRO.

# Program 1
## National Research Flagships

Since the launch of our first three National Research Flagships in 2003, we have committed an increasing proportion of our resources to addressing major national challenges and opportunities through our National Research Flagships Program. The Flagships tackle complex challenges by forming large-scale, multidisciplinary research partnerships with Australian universities, publicly-funded research institutions, the private sector and selected international organisations.

On 1 July 2013, we merged our Energy Transformed Flagship with our Advanced Coal Technology and Petroleum and Geothermal Research portfolios to create the Energy Flagship. In 2013–14, we devoted 60 per cent of our resources to our 11 National Research Flagships:


Biosecurity


Climate Adaptation


Digital Productivity and Services


Energy


Food Futures


Future Manufacturing


Minerals Down Under


Preventative Health


Sustainable Agriculture


Water for a Healthy Country


Wealth from Oceans.

### OBJECTIVES AND DELIVERABLES

A key objective of our CSIRO 2011–15 Strategy is to grow our National Research Flagships as a key mechanism for achieving outcomes relevant to the Strategic Research Priorities identified in the National Research Investment Plan[16].

Through these Flagships we intend to concentrate on strategic research, knowledge and technology transfer that have the potential to deliver major, long-term social, economic and environmental benefits to Australia. Each Flagship targets clearly defined goals, framed from a careful analysis of the needs of people and industry and has a strong focus on the adoption of research outputs to deliver positive impact for the nation.

Our ability to deliver profound impact through our National Research Flagships is underpinned by investment in core research capabilities. See page 58 for Program 2 – Core Research and Services.

**THROUGH THE NATIONAL RESEARCH FLAGSHIPS WE INTEND TO CONCENTRATE ON STRATEGIC RESEARCH, KNOWLEDGE AND TECHNOLOGY TRANSFER THAT HAVE THE POTENTIAL TO DELIVER MAJOR LONG-TERM SOCIAL, ECONOMIC AND ENVIRONMENTAL BENEFITS TO AUSTRALIA.**

### PROGRAM PERFORMANCE

This year, our National Research Flagships continued to perform well. An assessment of the Program's five key performance indicators (KPIs) identified in the Portfolio Budget Statements, showed we have met expectations and targets. Table 2.3 provides an overview of the evidence for each KPI with a more detailed analysis following.

16 The National Research Investment Plan is available at: www.industry.gov.au/research/Pages/NationalResearchInvestmentPlan.aspx

**TABLE 2.3: PERFORMANCE INDICATORS FOR PROGRAM 1 – NATIONAL RESEARCH FLAGSHIPS**

| KEY PERFORMANCE INDICATOR | TARGET (AND PERFORMANCE ASSESSMENT) | PERFORMANCE |
|---|---|---|
| Demonstrated adoption and impact of Flagship outputs | Grow economic, social, environmental and intangible benefits | Two external Flagship reviews were undertaken during the year: Minerals Down Under (MDU) in March 2014 and Water for a Healthy Country (WfHC) in August 2013. Two areas (Themes) of the Future Manufacturing Flagship (FMF) were reviewed in September 2013, and a report released for the Preventative Health Flagship (P-Health) review completed in June 2013.<br>The review identified that many MDU projects had the potential to be 'game-changers' for the mining industry and concluded the Flagship is well on track to deliver against its goal by 2030.<br>The WfHC review concluded the Flagship's overall science capability is excellent with internationally and nationally recognised strengths in hydrologic modelling, application of climate science, groundwater contamination, informatics and systems modelling.<br>The FMF Themes reviewed, 'Biomaterials and Medical Devices' and 'Australian Biotech Growth Partnerships', were found to be well placed to assist the Flagship in meeting its objectives.<br>The P-Health review recommended several improvements, including structural changes, with a focus on obesity. The panel also considered elements of the existing colorectal cancer Theme should continue. |
| Customer satisfaction and engagement | Maintain | This year is the second year of our client satisfaction survey. We maintained our performance with results showing an average 'willingness to recommend' score of 8.6 out of 10 (up from 8.5). |
| Number of refereed Flagship publications | Maintain or increase | In 2013, the number of refereed Flagship publications grew by 11 per cent (2229 in 2013 compared with 2007 in 2012). This included 603 conference papers, 1238 journal articles, 136 books/chapters and 252 technical reports. |
| Financial support by Flagship partners | Maintain or increase | Revenue from external partners was $275.7 million, an increase from $270 million reported in the previous year. |
| Investment of the Flagship Collaboration Fund | As per plan | As at 30 June 2014, almost $132 million has been committed over the life of the Flagship Collaboration Fund. This includes $14.2 million in grants committed in 2013–14. |

**Blue shading**: indicates positive progress for the year and the target has been achieved.

## Demonstrated adoption and impact of Flagship outputs

To maximise achievement of Flagship goals, we conduct independent reviews of each Flagship on a three-to-four-year cycle. The reviews are conducted by a panel of scientific and industry experts from Australia and overseas[17].

In 2013–14, reviews were undertaken of our Minerals Down Under (MDU) and Water for a Healthy Country (WfHC) Flagships, plus two Themes within our Future Manufacturing Flagship (FMF). A report was also released for the Preventative Health Flagship review completed in 2012–13.

As part of the review process, assessment panels rate each research Theme within the Flagship for the probable impact on end-users. For the reviews undertaken in 2013–14, the panels assessed that for 73 per cent of the Themes, the outputs would enable users who adopted the outputs to distinguish themselves from their peers or competitors in terms of economic growth, environment, social and intangible benefits. Ratings were not provided for the Preventative Health Flagship.

A summary of the key outcomes from each Flagship review follows.

### *Minerals Down Under Flagship*

*GOAL: Delivering science and technology options for the discovery and efficient development of Australia's mineral resource endowment that will lead to $1 trillion in-situ value by 2030 and enable flow-on benefits to the wider national economy.*

Date of review: March 2014

The review panel commended the Flagship's goal for being clearly-defined and relevant supported by a carefully planned 'path to impact' across the breadth and depth of the Flagship.

The panel found the Flagship had an impressive range of expertise and equipment to enable it to achieve its objectives, although there was some variability across research platforms. It had also developed strategic partnerships with external collaborators for when additional capabilities were needed.

The panel identified many projects in the Flagship with the potential to be 'game-changers' for the mining industry and concluded that the Flagship is well on track to deliver against its goal by 2030. These projects included the Lab-at-Rig system, the Large Open Pit project, nickel laterite ore processing and the low-emission integrated steelmaking process.

**THE PANEL IDENTIFIED MANY PROJECTS IN THE MINERALS DOWN UNDER FLAGSHIP WITH THE POTENTIAL TO BE 'GAME-CHANGERS' FOR THE MINING INDUSTRY AND CONCLUDED THAT THE FLAGSHIP IS WELL ON TRACK TO DELIVER AGAINST ITS GOAL BY 2030.**

17 See Glossary on page 199 for the Flagship Review Terms of Reference.

### *Water for a Healthy Country Flagship*

*GOAL: Consistent with Australia's national interest, develop science and technologies that improve the social, economic and environmental outcomes from water, and deliver $3 billion per year in net benefits for Australia by 2030.*

Date of review: August 2013

The review panel noted that the Flagship was making good progress towards its defined goal and that the research resources of the Flagship and its partners were focused on water and related issues of great importance and national significance.

The panel concluded that the overall science capability of the Flagship was excellent, with internationally and nationally recognised strengths in hydrologic modelling, application of climate science, groundwater contamination, informatics and systems modelling. Partnerships and collaborations were assessed as effectively enhancing science capabilities and outcomes. Continued effort is required to adjust the Flagship's research portfolio in preparation for opportunities that will emerge given the cycle of extreme floods and droughts in Australia.

The panel recommended that the Flagship broaden its skills to address challenges of national significance involving climate, agriculture, energy and oceans, which are beyond the current scope of the Flagship.

### *Future Manufacturing Flagship*

*GOAL: To create $2 billion of additional annual value for Australia's manufacturing industry by 2025 through the development and application of resource efficient, clean and transformational technologies.*

Date of review: September 2013 (partial review)

The two Flagship Themes reviewed were 'Biomaterials and Medical Devices' and 'Australian Biotech Growth Partnerships'. The Themes were chosen because they had recently moved into the Flagship. The panel found both Themes were well placed to assist the Flagship in meeting its objectives, but recommended their ability to meet their targets be closely monitored as both are fast moving fields within competitive environments.

**THE PANEL CONCLUDED THAT THE OVERALL SCIENCE CAPABILITY OF THE WATER FOR A HEALTHY COUNTRY FLAGSHIP WAS EXCELLENT, WITH INTERNATIONALLY AND NATIONALLY RECOGNISED STRENGTHS.**

### *Preventative Health Flagship*

*GOAL: To improve the health and wellbeing of Australians and save $2 billion in annual direct health costs by 2020 through the prevention and early detection of chronic diseases.*

Date of review: June 2013 (Report released July 2013)

The review panel recommended that the Flagship be restructured, narrow its focus to the obesity aspects of health and be renamed to reflect this. The panel noted the obesity Theme included nationally-recognised thought leaders on attempted mitigation of established obesity and proposed this research area be rapidly expanded in the repositioned Flagship. Due to the increased prevalence of colorectal cancer in obese people, the panel considered that elements of the existing colorectal cancer Theme should continue. While noting the contribution that CSIRO had made to a number of collaborative partnerships, (in relation to existing activities in brain health and other colorectal cancer research) the panel concluded it would fall outside the framework of the new Flagship. The panel additionally recommended that CSIRO expand its public role in diet and obesity.

In response to these recommendations, from 1 July 2014 the Preventative Health and Food Futures Flagships will come together under a new Food and Nutrition Flagship.

## Customer satisfaction and engagement

We are committed to continue to be a trusted advisor to our partners and to engage with industry, government and the community to deliver profound impact. Each year we work with almost 3000 organisations, fostering a collaborative approach to research and development with a focus on transforming research outputs into real world results. We maintain relationships with government departments and agencies at all levels. This year our industry customers included more than 1200 Australian SMEs, 500 big Australian companies and 450 multinationals.

We work with industry stakeholders and industry associations and provide input to Government policy on matters affecting Australian industry. We are also active in supporting innovation in industry through collaboration vehicles such as CRCs and providing funding opportunities to high-potential SMEs (see page 60 for SME engagement).
In particular, we are continuing to work with key Australian and international manufacturing and resources companies.

**THIS YEAR OUR INDUSTRY CUSTOMERS INCLUDED MORE THAN 1200 AUSTRALIAN SMES, 500 BIG AUSTRALIAN COMPANIES AND 450 MULTINATIONALS.**

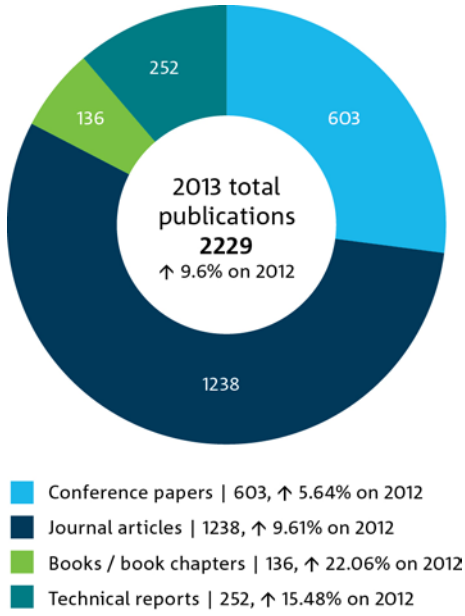
We're listening to customers more systematically. We have sourced feedback from over 250 clients over the past two years and acted on their feedback to improve impact from science, project delivery and client engagement. On average our customers rated us 8.6 out of 10 this year (more on page 23) maintaining the strong performance we achieved last year.

This year we continued our large-scale collaborations through research alliances with major organisations including General Electric, Grains Research and Development Corporation, Boeing and Orica. We are increasingly developing organisation-wide and cross-Flagship relationships to assist our clients in accelerating outcomes that resonate with their organisations and provide real value. We've identified practices in our existing longstanding relationships and alliances which will inform us in establishing successful new relationships in the future.

## Number of refereed Flagship publications

The total number of refereed Flagship publications increased by 11 per cent between 2012 and 2013 (see Figure 2.4). This rise is due to the increased alignment of our research Themes with the Flagship Program and improved reporting in our publication repository, ePublish.

**FIGURE 2.4: FLAGSHIP PUBLICATIONS**[18]




18 See Glossary on page 199 for definitions of publication types.

## Financial support by Flagship partners

In 2013–14, $275.7 million in revenue for the National Research Flagships Program was received from external partners. The external revenue equates to 38 per cent of total funding for Flagships.

## Investment of the Flagship Collaboration Fund

The Flagship Collaboration Fund continues to perform its role as a key mechanism for supporting impact partnerships across our Flagships that assist delivery against their goals. This year it invested a total $14.2 million in the Flagship Program to engage external partners. More than 50 projects, visiting fellowships, student scholarships and workshops provided specific expertise and talent development opportunities for the Flagships and their partners in areas such as:

- new applications for Clean Chemical Manufacturing
- designing a platform for collaboration on clean coal initiatives between Australia, the United States and China
- opportunities to enhance collaboration between industry and researchers in food security and agricultural productivity – considered a key input to the G20 discussions.

This year saw the conclusion of a three-year Wealth from Oceans Coastal Collaboration Cluster, established to identify the key social and institutional barriers and enablers to the uptake of science in the management of the coastal zone. The Cluster has developed a useful online toolkit for government, community and industry with more than a dozen guides to undertaking coastal research, a range of case studies, an adaptive learning toolkit and around 100 annotated coastal publications for easy reference.

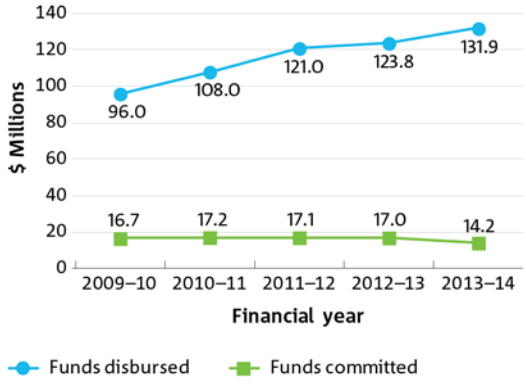
The three-year Urbanism, Climate Adaptation and Health Cluster also concluded. This Cluster brought together researchers from a range of disciplines to develop adaptation strategies that will safeguard the health of urban populations in the face of a variable and changing climate. The Cluster focused on the health implications of extreme heat, understanding and controlling mosquito vectored diseases, urban transport and effects on air pollution, urban food security and safety, and the cross-cutting interactions between environment and health. The Cluster concluded with a National Science Symposium held in Canberra which was attended by 150 participants. More than 90 publications were produced, including over 30 published journal articles.

**$14.2M**

**WAS INVESTED BY THE FLAGSHIP COLLABORATION FUND TO ENGAGE EXTERNAL PARTNERS.**

Investment in the Flagship Collaboration Fund continued on a similar growth trajectory to previous years. This growth pattern has resulted in almost $132 million to date being committed to assist Flagships and their partners in delivering their goals (see Figure 2.5).

**FIGURE 2.5: FLAGSHIP COLLABORATION FUND DISBURSEMENT AND COMMITMENTS**



# Biosecurity Flagship

## Analysis of performance

### THE CHALLENGES

As the world becomes more inter-connected, Australia's ability to protect itself from exotic pest and disease threats faces growing pressure. Global trade and the movement of animals, plants and people continue to increase, plus a changing climate can alter the magnitude or range of threats from pests and diseases. At the same time, levels of expertise and resources in biosecurity research are declining.

### OUR RESPONSE

Our Biosecurity Flagship has joined forces with industry and government to find a solution to Australia's Queensland fruit fly (Qfly) problem. SITplus™ is a five-year, $24 million partnership focused on developing a sterile line of male Qfly, as well as release and monitoring strategies, to effectively control what is one of our nation's most damaging horticultural pests.

Our researchers are providing critical science capabilities, expertise and infrastructure to support the Medical Countermeasure Products Australia taskforce. This industry-led body aims to grow national capability and industries that can develop medical countermeasure products to meet agreed national and international priorities.

With our partners, we have identified highly effective means of managing invasive species through biological control. Our recent focus has been weeds of national significance, including the devastating Parkinsonia and fast-spreading Crofton Weed. We are also leading a global research team that has identified and is now assisting in the management of the destructive cotton bollworm attacking Brazilian crops.

### OUR PATHWAYS TO IMPACT

To protect the health of animals and people, we undertook further research to confirm the world-first Hendra virus horse vaccine, Equivac® HeV, provides immunity for 12 months; this provides greater confidence for horse owners and the equine industry. Since the launch of the vaccine, more than 200,000 doses have been administered. While vaccination prevents Hendra virus infection in horses, its greatest impact is in breaking the chain of transmission of the virus from bats, via horses, to people. Hendra virus infections in humans are often lethal.

Collaborative research has led to a report on innovative quantitative techniques for estimating the progress of vertebrate pest control programs. Biosecurity Tasmania is incorporating the report's findings along with other data to determine success of their red fox eradication program. This approach will inform managers on the program's progress, enabling optimal allocation of resources to control and surveillance.

### BIOSECURITY FLAGSHIP ROADMAP[19]

| THEME | 1–3 YEARS | 4–9 YEARS | 10+ YEARS |
|---|---|---|---|
| **Biosecurity risk preparedness and prevention** | Strengthen Australia's capacity to assess risk, protect borders and improve initial response, reducing the likelihood of threats and minimising their impacts. | Apply risk assessments to internationally relevant targets and deploy enhanced surveillance systems for terrestrial and marine ecosystems. | A responsive, resilient biosecurity system based on coordinated policy, new surveillance technologies and pre-emptive response. |
| **Managing pests, pathogens and invasive species** | Develop cost-effective management solutions to prevent and reduce biosecurity incursion impacts. | Deployment of new cost-effective solutions to improve commodity market access, and improvements in on-the-ground biosecurity regulatory responses. | Responsive, resilient biosecurity system using technologies that allow rapid response to incursions and effective management of market access issues. |
| **One Health – emerging infectious diseases** | One Health approach to emerging infectious disease, and establish platforms of research for medical countermeasures. | Multidisciplinary capability in advanced animal and human health technologies, virology, and modelling to deliver outcomes for emerging disease threats. | Global network of research that supports Australia, and the world, to reduce the risk of pandemics and bioterrorist threats. |

● Progress to 2012–13 ● 2013–14

19 The Flagship roadmap was updated to reflect changes in the Flagship's strategic direction.

**GOAL[20]: TO SUPPORT AUSTRALIA'S SOCIAL, ENVIRONMENTAL AND ECONOMIC WELLBEING BY REDUCING THE RISK OF PESTS AND DISEASES ENTERING AUSTRALIA AND IMPROVING THE EFFECTIVENESS OF MITIGATION AND ERADICATION RESPONSES.**

## Bee sensors take flight to help farmers

Bees are estimated to contribute between $4 and $6 billion to the Australian economy annually. They provide a free pollination service for our agricultural industries. In fact around one third of the food we eat relies on pollination.

However, honey bee populations around the world are crashing because of Varroa mite and Colony Collapse Disorder.

To address this issue, CSIRO is working with the University of Tasmania, the Tasmanian Beekeepers Association, local beekeepers in Hobart, and fruit growers around the state to improve honey bee pollination and productivity on farms and help understand the drivers of Colony Collapse Disorder.

Our scientists have fitted thousands of honey bees with tiny sensors to monitor the insects and their environment, using a technique known as 'swarm sensing'. It is the first time such large numbers of insects have been used for environmental monitoring.

The research will also look at the impacts of agricultural pesticides on honey bees by monitoring insects that feed at sites with trace amounts of commonly used chemicals.

Understanding bee behaviour will give farmers and fruit growers improved management knowledge enabling them to increase the benefit received from their free pollination service. It will also help them gain and maintain access to markets through improving the way we monitor for pests.

**1000+ MONITORING SENSORS HAVE BEEN FITTED TO AUSTRALIAN HONEY BEES.**

The sensors are tiny radio frequency identification sensors that work in a similar way to a vehicle's e-tag, recording when the insect passes a particular checkpoint. The next stage is to reduce the sensor's size to just one millimetre so they can be attached to smaller insects such as mosquitoes. Already our researchers have started trialling these sensors on the highly destructive Queensland fruit fly.

**Honey bees are a major pollinator of flowers and crops. Up to one third of the food we eat relies on pollination.**

20 The Flagship's goal was finalised in 2013–14 with slight amendments from the previous year.

# Climate Adaptation Flagship

## Analysis of performance

### THE CHALLENGES

Climate change and variability will pose even greater challenges for societies and economies into the future, requiring a more proactive approach to decision-making. Extreme climate events across Australia highlight the need to be better prepared to manage current and future climate risks.

### OUR RESPONSE

Our Climate Adaptation Flagship has worked with government, industry and communities to build resilience to climate change and variability, by providing practical options and solutions.

Working with the seafood industry, the Flagship provided seasonal forecasting of future environmental conditions for fish habitats – including prawn, tuna and salmon – to help enable longer-term decision-making to increase profitability across marine industries.

We delivered climate projections to support natural resource management (NRM) organisations across Australia refine their regional NRM plans. This will help identify locations where landscape adaptation and mitigation activities should be undertaken.

The Flagship was a critical contributor to the Regional Climate Change Adaptation Plan for the Eyre Peninsula, South Australia. This community report consolidates climate change planning work and identifies pathways and actions relevant to agriculture, aquaculture, tourism and mining industries, which are reliant on sustainable natural resources.

### OUR PATHWAYS TO IMPACT

Working with the Australian Government to identify likely impacts of four hazards on residential housing – coastal inundation, extreme winds, fire and inland flooding – the Flagship analysed policy options and recommended responses that could save at least $100 billion nationally.

The Flagship also embedded adaptation strategies and practices for households in Cambodia, Bangladesh, Laos and Andhra Pradesh (India). In Cambodia, these are being delivered across five provinces, enabling farmers to double rice production and achieve labour savings that allow them to pursue other income generating opportunities. From 40 communities in 2013, the program could reach 40,000 farming households once fully implemented. The impact this would have on food security benefits Australia by reducing the threat of regional instability.

### CLIMATE ADAPTATION FLAGSHIP ROADMAP

| THEME | 1–3 YEARS | | 4–9 YEARS | 10+ YEARS |
|---|---|---|---|---|
| **Pathways to adaptation** | Define new approaches to vulnerability and adaptation assessments. | Adaptive capacity of communities and industries assessed. Innovative approaches to climate projections. | Identify social and economic adaptation outcome within different sectors and regions. | Biophysical social and institutional dimensions of adaptive capacity more effective for Australia. |
| **Sustainable cities and coasts** | Develop methods to assess climate risk and vulnerability in cities and coasts and community adaptive capacity and governance. | | Flexible models of utilities, social sciences and governance for climate adapted urban planning and management. | Planning, design infrastructure, management and governance solutions for Australia's cities and coasts responding to climate change. |
| **Managing species and natural ecosystems** | Studies of regions, single species and simple species interactions. | Greater model realism. Focus on threats and tools to assist natural resource managers. | Complex studies of biotic interactions and community ecology. Refine tools for ecosystems managers. | Deliver adaptation options to protect Australia's marine and terrestrial species and ecosystems from the impacts of climate change. |
| **Adaptive primary industries, enterprises and communities** | Improve analysis of interaction between climate drivers and managers' responses on farms. | Develop technologies and practices for local industry adaptation. | Shifts in vulnerability to climate change understood. Identify when transformational options may be needed. | Adaptation strategies provide economic benefits and improve livelihoods from primary industries, enterprises and communities. |

● Progress to 2012–13 ● 2013–14

**GOAL: TO EQUIP POLICY MAKERS, INDUSTRIES AND COMMUNITIES WITH PRACTICAL AND EFFECTIVE ADAPTATION OPTIONS TO CLIMATE CHANGE AND VARIABILITY AND IN DOING SO CREATE IN THE NATIONAL INTEREST $6 BILLION PER ANNUM IN NET BENEFITS BY 2030.**

## Apps for critical bushfire assessment help mitigate future fire impacts

Bushfires have long been a key part of Australia's environment. They are influenced by many factors, including warmer and drier conditions, extreme heat, strong winds and low humidity, housing design and materials and fuel loads and management. Climate change projections indicate we are going to see an increase in the frequency of fire weather.

In response, our Climate Adaptation Flagship, together with the New South Wales (NSW) Rural Fire Service, developed two new apps for Android tablets. These helped conduct critical assessments of the recent bushfires in 2013 that devastated communities in the state and to plan responses to future climate risks.

The *Rapid Impact Assessor* app enabled the NSW Rural Fire Service and CSIRO teams to enter a bushfire zone and quickly gauge the extent to which properties were left untouched, damaged or completely destroyed. The app works in real-time and multiple teams can use it simultaneously.

The *House Surveying Tool* app captures the finer detail around a house, such as its design and surrounding landscape. The information is loaded into a geodatabase and analysed for further insights into fire management and prevention of house losses.

Daniel Gibson from the NSW Rural Fire Service says: 'Working with CSIRO helps us analyse the impact of fires on communities and buildings and helps us improve community safety in the future, particularly where people are living in bushfire-prone areas'.

**'WORKING WITH CSIRO HELPS US…IMPROVE COMMUNITY SAFETY IN THE FUTURE.' – NSW RURAL FIRE SERVICE.**

The apps are also being tested by other agencies as part of the state's bushfire response. This creates the potential for unified data collection across multiple agencies, making sharing critical, life-saving information easier, faster and more efficient to manage.

**CSIRO's Justin Leonard (right) demonstrates the Rapid Impact Assessor app to Daniel Gibson of the NSW Rural Fire Service.**

# Digital Productivity and Services Flagship

## Analysis of performance

### THE CHALLENGES

The services sector represents approximately 80 per cent of Australia's Gross Domestic Product, touching all industries. Therefore productivity of this sector is a national priority. As broadband technology continues to rapidly open up opportunities, businesses and governments need help in delivering new, faster and better services to maintain a competitive edge, and ensure their effectiveness, efficiency and uptake by consumers.

### OUR RESPONSE

Our Digital Productivity and Services Flagship uses data and digital technologies to develop smarter ways to improve productivity, growth and service delivery.

A recent survey found approximately 20 per cent of the population do not use the Internet and only half of Australian businesses have websites. These findings will inform future education programs aimed at addressing the digital divide in our society and economy.

The Superannuation Research Cluster, a partnership between CSIRO, Monash University and several industry and government partners, is exploring alternative ways of investing Australia's superannuation funds for safer and more successful returns, while providing easier options for individuals to explore investment opportunities.

We continue to work with the Department of Human Services to move more customers to online channels, and the Australian Taxation Office to encourage more online tax refund payments.

### OUR PATHWAYS TO IMPACT

In collaboration with the Australian eHealth Research Centre and the Queensland Government, the Flagship released the Australian Medicines Terminology, AMT v3, browser, featuring better utilisation of the SNOMED international health terminology standard. Such tools are estimated to provide a total value of impact of $161.9 million per year through improved health outcomes and reduced system costs.

This year, the Flagship licensed many of its technologies, such as its high-speed wireless backhaul system Ngara, broadband access technology, and 3D laser mapping technology. A number of computer vision technologies have also been adopted by 3P Learning to develop online education tools for schools.

### DIGITAL PRODUCTIVITY AND SERVICES FLAGSHIP ROADMAP

| THEME | 1–3 YEARS | 4–9 YEARS | 10+ YEARS |
|---|---|---|---|
| **Government and commercial services** | Superannuation Cluster established. Social media monitoring in 30 agencies. The Department of Human Services saves $200 million per annum. | Social media monitoring across government. UN adopts Gazetteer. Government interactions online reach 80 per cent. Government staff tele-work rate is 12 per cent. | Human Services productivity increased 20 per cent and ten per cent reduction in cost of natural disasters. Up to 25 per cent of Australian superannuation invested in infrastructure. |
| **Health services** | Patient flow tools trialled. Clinical record computing tools in use. Telehealth platform in use. | Patient flow saving $100 million per annum. Clinical terminology service and systemic hospital model developed. Reporting delays reduced by 25 per cent. Telehealth system implemented. | Electronic health records leveraged. Telehealth addresses rural hospitalisation. Systemic modelling for health policy. Digital technologies reduce forecast healthcare by $1 billion per annum. |
| **Smart secure infrastructure** | Ngara backhaul technology transfer and Ngara access technology multi-year trials started. Museum robot installed at three sites. Simultaneous localisation and mapping technology transfer. | Ngara deployed in rural areas. Tele-immersion tools adopted for online education and commerce. Cyber security policies and tools adopted. | Economic contribution of digital infrastructure reaches $600 million per annum. Service platforms increase online industry by $400 million per annum. Cyber tools reduce losses by $600 million per annum. |

● 2012–13 ● 2013–14

**GOAL: BY 2025, WE AIM TO CREATE $4 BILLION PER ANNUM IN ADDED VALUE FOR THE AUSTRALIAN ECONOMY BY DEVELOPING AND DELIVERING MORE EFFICIENT AND INNOVATIVE SERVICES THAT IMPROVE PEOPLE'S WELLBEING AND PROSPERITY.**

## Finding insight in the social media haystack

Social media produces a massive amount of information; 6000 tweets alone go out every second around the world. Organisations can learn a lot from this information to better tailor their services and give customers what they want. But with so many channels, social media monitoring has become challenging and time consuming.

Our Digital Productivity and Services Flagship developed social media monitoring tool Vizie, that is transforming the way governments listen to, understand and respond to customers.

This year, Vizie assisted around 30 organisations providing real-time insights to a range of situations.

**~30 COMPANIES IN 2013–14 GAINED REAL-TIME INSIGHTS BY USING OUR VIZIE TOOL.**

The National Mental Health Commission uses Vizie to better understand community thinking on mental health and wellbeing, identifying key issues on a daily basis and providing reports that are easy to understand and quick to produce.

The Department of Human Services (DHS) uses Vizie to manage social media engagement with customers. Amanda Dennett, DHS Senior Social Media Advisor, says: 'We find issues that we were never aware of before and we're more efficient as a result because the tool allows us to respond more quickly'.

Vizie allows DHS staff to prioritise posts, identifying which ones need greater attention or immediate follow-up to prevent the spread of misinformation. Staff are able to respond quickly providing customers with the right information and also to track posts that have been responded to so not to duplicate work.

Unlike other tools, Vizie is designed to support customer engagement, not simply provide summaries of social media activity. It also has a unique visualisation component, a river graph that shows retrieved posts, so users can instantly see hot topics and how they are changing over time. They can also isolate the original post to discover its context.

Analysing social media to find relevant information is like looking for a needle in a haystack, but Vizie is helping organisations filter through the noise and improve decision-making by providing a smarter, more efficient way to monitor and respond to social media.

**Vizie helps government agencies gain insight to their customers for improved decision-making and productivity. Image: iStock**

# Energy Flagship

## Analysis of performance

### THE CHALLENGES

Australia's economy depends on reliable and cost competitive energy. Energy is also the major contributor to our nation's greenhouse gas emissions. Our challenge is to maintain energy security and affordability while reducing negative environmental, economic and social impacts.

### OUR RESPONSE

Our Energy Flagship conducts research across all relevant forms of energy for Australia.

The Flagship is conducting research towards a major trial of its Direct Injection Carbon Engine (DICE) in Victoria's Latrobe Valley. This technology uses a refined carbon slurry in highly efficient diesel engines. It has potential to lower power costs, reduce greenhouse gas emissions by 20 to 50 per cent compared to current technologies and create new export markets.

We have also developed tools to predict the effects of sand erosion in gas wells, on down-hole tools and underground facilities. This will help gas companies predict failure points, improve gas completion designs and reduce the costs of maintenance programs.

### OUR PATHWAYS TO IMPACT

The Flagship has achieved a world-first by producing supercritical steam (very high temperature and pressure steam) from solar energy alone. Today's most efficient steam turbines require supercritical steam to produce electricity. This is yet another step towards lower cost renewable energy.

Another important study measured the implications of the 5-Star Energy Efficiency Standard for residential buildings. We found that 5-star homes consume up to 56 per cent less energy for heating compared to 3.5 to 4-star homes (depending on the city). This work helps homeowners and builders better understand how the energy efficient star ratings work and what its actual costs and benefits are.

### ENERGY FLAGSHIP ROADMAP[21]

| THEME | 1–3 YEARS | 4–9 YEARS | 10+ YEARS |
|---|---|---|---|
| **Local energy systems** | Develop low-emission distributed energy technologies. | Develop distributed generation and efficient options model. | Reduce greenhouse gas emissions by driving the uptake of distributed energy solutions, demand reduction and energy efficiency measures. |
| **Coal mining** | Uptake of enhanced mining technologies and transfer of coal preparation technologies to mines. | Adoption of technologies for longwall top coal cave mining, coal mine methane capture and intelligent coal processing plant. | Uptake of multi seam mining and ventilation air methane technologies. One operational automated coal mine rapid roadway development system. |
| **$CO_2$ capture and geological storage** | Develop research and development facilities, for carbon dioxide storage and monitoring. | Patent solvent technologies and membrane and solid adsorbent technologies. Develop Post Combustion Capture plant for environmental regulation. | Three storage sites characterised with a high level of confidence having storage capacity of 100 megatonnes each. |
| **Fuels and products** | Fuel gasification performance data used in proprietary technology models. | Pilot-scale demonstration of hydrogen from coal. | Pilot-scale demonstration of synfuel production from natural gas and stored solar heat. |
| **Petroleum exploration and production** | New technologies and reports developed for reservoir characterisation. Risk based hydrate management approaches. | Improved reservoir characterisation for microbially enhanced coal seam gas (MECSM). Study of coal seam gas fugitive emissions. Technologies for corrosion/sand erosion. | Key findings on fracture asymmetry, MECSM production, aromatic hydrocarbon distribution in coals and their partitioning to formation water. New technologies for detecting hydrocarbon sources. |
| **Alternative stationary energy** | Demonstrate solar field technology platform and Direct Carbon Fuel Cell facility. Undertake social attitude mapping. Hold stakeholder energy forum. | Complete Australian Renewable Energy Agency work. Install DICE demonstration project. Demonstrate dispatchable solar plant and design a Levelised Cost of Energy commercial plant. Hold stakeholder transport forums. Undertake larger population social analysis studies. Initiate integrated carbon assessment service. | International adoption of solar research. Support for DICE engines operating in Australia, China, Europe. Deploy integrated energy, water, food and carbon assessment service. |

● Progress to 2013–14

21 In July 2013, CSIRO merged its Energy Transformed Flagship, Petroleum and Geothermal Portfolio and Coal Portfolio to form the new Energy Flagship. The Flagship roadmap reflects the new Flagship strategy. Previous year comparison is not possible.

**GOAL: TO DELIVER SCIENCE AND TECHNOLOGY OPTIONS BY 2020 THAT WILL ENHANCE AUSTRALIA'S ECONOMIC COMPETITIVENESS AND REGIONAL ENERGY SECURITY; ENABLE AUSTRALIA TO TRANSITION TO A LOWER EMISSIONS ENERGY FUTURE; UNLOCK $100 BILLION OF *IN-SITU* VALUE FROM OUR ENERGY RESOURCES, AND CONTRIBUTE 32 MEGATONNES PER ANNUM OF GREENHOUSE GAS ABATEMENTS BY 2030.**

## Keeping buildings OptiCOOL: delivering next generation energy management

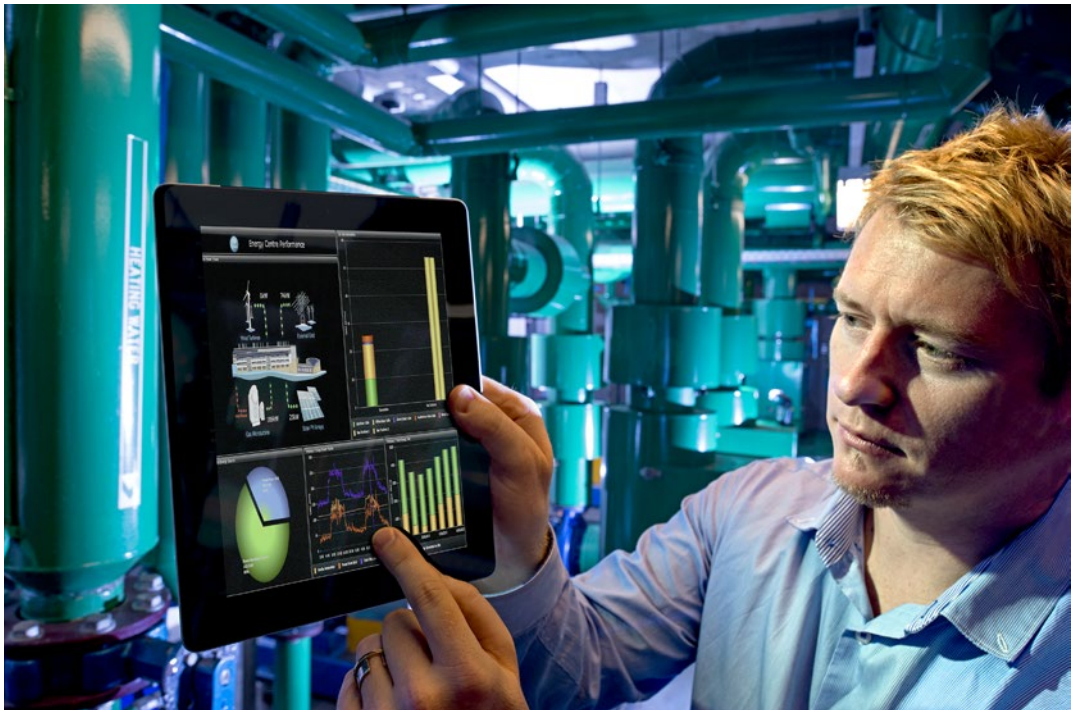
In Australia, around 50 per cent of energy consumption in commercial buildings comes from heating, ventilation and air-conditioning (HVAC). To address this, CSIRO developed OptiCOOL, a clever technology designed to improve energy efficiency and reduce peak demand – a key driver behind costly network expansions. The system intelligently alters the operation of a building's HVAC control system according to settings for cost savings, occupant comfort and energy efficiency.

Under an exclusive licence to an Australian start-up company, the technology is now commercialised as BuildingIQ and installed in around 1.4 million square metres of buildings (equivalent to 92 football fields), including the Rockefeller Centre in New York City. In Australia, it helped a Sydney high-rise building save an average 23 per cent of its energy costs during the first seven months of operation. The total dollar savings exceeded the costs within the first year.

BuildingIQ was recently named in the Global Cleantech 100 as one of the top private companies in clean technology providing the next generation of energy management for commercial buildings. The technology also won the prestigious Bloomberg 2013 New Energy Pioneers award, ranking BuildingIQ as one of the top ten game-changing companies in clean energy technology and innovation. The technology has also won seven industry awards, including the Sustainable Engineering Association Award for Excellence in Innovation and the EcoGen Award for Most Outstanding Clean Energy Technology Innovation.

In 2013, BuildingIQ secured $9 million in venture funding that is helping to further accelerate the technology uptake.

The OptiCOOL technology can be fitted to almost any HVAC control system and is helping building owners across Australia and the United States reduce energy running costs without sacrificing comfort of occupants.



**OptiCOOL technology is helping reduce energy consumption by intelligently altering a building's HVAC control system.**

# Food Futures Flagship

## Analysis of performance

### THE CHALLENGES

The Australian agrifood sector is facing a globally-increasing demand for food with limited land and resource use and an additional need for optimal nutrition in food products.

### OUR RESPONSE

Our Food Futures Flagship, in partnership with Nuseed and the Grains Research and Development Corporation, has developed canola containing high levels of long-chain omega-3 oils. This is an important step towards providing a sustainable, land-based source of long-chain omega-3 to meet growing global demand. Nuseed will begin conducting field trials of the genetically-modified omega-3 canola later in 2014.

Flagship researchers have demonstrated proof of principle applications of the CYBERTONGUE® biosensor technology, for highly sensitive safety and quality monitoring in food and beverages. This will help protect consumers from some food safety threats and improve market access for food producers.

Our researchers have also lodged a provisional patent for the early detection and management of malaria, using a specific family of molecules present in expired breath. This will open up new research and collaboration opportunities in the area of breath diagnosis and sensor development.

### OUR PATHWAYS TO IMPACT

Together with Australian Capital Ventures, the Flagship established a spin-out company, BARLEYMax Enterprises, specialising in developing and commercialising novel grains with known health benefits. Five food manufacturing companies have now been licensed to use the CSIRO-developed BARLEYmax™ grain in their products.

A new genetic test for hornless cattle has been developed and is available to producers. This is a valuable tool as cattle with horns can injure other animals, as well as stock handlers. The new test is 99 per cent accurate across all cattle breeds grazed in Australia (more on page 71).

Production of Novacq™, CSIRO's patented bioactive prawn feed ingredient that sees farmed prawn stocks grow on average 30 per cent faster, has commenced under licence in Australia, Indonesia, China and Vietnam, with further licences under negotiation (more on page 45).

The Flagship's industry research partnerships for selective breeding of Pacific oysters, abalone, Black Tiger prawns and Atlantic salmon have all been renewed. These programs continue to achieve greater than ten per cent gains in growth per generation, increasing farm productivity for our industry partners and product quality for consumers.

### FOOD FUTURES FLAGSHIP ROADMAP

| THEME | 1–3 YEARS | 4–9 YEARS | 10+ YEARS |
|---|---|---|---|
| **Future grains** | Optimise carbohydrate in grains, optimise omega-3 oils in plants and investigate genetic traits for improved quality and nutrition. | Combine beneficial traits for farmers and consumers, breed and commercialise long chain omega-3 oils in plants and commercialise quality and nutrition traits. | Increase returns to Australia by $550 million per annum through enhanced grain quality attributes and human health benefits. |
| **Breed engineering** | Animal management systems adopted and breeding technology developed with commercial partners. | Industry adoption of testes cell transfer techniques, success of aquatic breeds and novel feeds and optimal genetics in livestock and aquaculture. | Boost the value of Australia's animal-based food industries by $350 million per annum for beef and $550 million for seafood. |
| **Quality biosensors**[22] | Development of test technology, odours predicting grape and wine quality identified. | Biosensor developed and adoption commenced in defence domain. Benchtop prototype completed and field prototype commenced. Applications for food safety and quality in development. | Apply technology to food safety and process control, clinical diagnosis, biosecurity and security/law enforcement, delivering value in excess of $750 million per annum. |

● Progress to 2012–13 ● 2013–14

22 The Quality Biosensors Theme changed from last year to reflect a new focus and wider applicability of the technology.

**GOAL: TO TRANSFORM THE INTERNATIONAL COMPETITIVENESS OF THE AUSTRALIAN AGRIFOOD SECTOR, ADDING $3 BILLION IN ANNUAL VALUE, BY APPLYING FRONTIER TECHNOLOGIES TO HIGH POTENTIAL INDUSTRIES.**

## Novacq™ feed additive for prawn aquaculture sustainability and profitability

One third of the annual worldwide fish catch is used to produce fish meal for farmed fish and crustaceans. This, combined with a globally-growing demand for fish and other protein from marine sources, means there is a critical need to develop cost-effective, sustainable alternatives to wild-harvest fish products for aquafeeds.

CSIRO's novel prawn feed additive, Novacq™, will reduce the Australian prawn farming industry's reliance on fish meal and fish oil for feeds, a world-first achievement in sustainability.

*Novacq* will also increase the productivity of the industry. Adding it to the diet of farmed prawns results in stock that grow on average 30 per cent faster and are healthier, while remaining a high-quality product for consumers.

*Novacq* is the result of over a decade of CSIRO research into prawn nutrition. It is an entirely natural food source based on the smallest organisms in the marine environment – the microbes that are the foundation of the marine food pyramid.

The $75 million Australian prawn farming industry was the first to benefit from *Novacq*, with successful farm trials conducted at one of Australia's leading prawn farming companies, Australian Prawn Farms. The growth rate and health benefits of *Novacq* have since been demonstrated in Black Tiger prawns and Vannamei shrimp, the major breeds for both the local and international industries.

In July 2013, Australian company Ridley AgriProducts became the first licencee for the Australian and global markets. It is currently scaling-up production prior to moving into full-scale commercial production in 2014.

CSIRO has now issued licences for territories representing 66 per cent of the global prawn feed market and initial royalty payments have already been received. Licencees in China and Vietnam are also moving into full-scale commercial production in 2014.

**Farmed prawns fed with Novacq™ grow faster and provide a healthy, high-quality product for consumers.**

# Future Manufacturing Flagship

## Analysis of performance

### THE CHALLENGES

Australian manufacturers face significant challenges to remain globally competitive. Companies are looking to improve productivity and resource efficiency and become more agile to adjust to market conditions and trends.

With Australian company Oventus, we developed customised 3D printed mouthpieces for sleep apnoea sufferers. As a partner in the CRC for Polymers, we also worked with Australian company Mesoblast to develop new materials and cost-effective manufacturing processes for the emerging cell therapy industry.

We helped develop the Advisory System for Processing, Innovation & Resource Exchange program, which runs economic models of options for recycling, sourcing raw materials and reviewing product 'end of life'. These models will reduce landfill, assist governments, and increase operational margins for small to medium businesses.

### OUR PATHWAYS TO IMPACT

We continued to gain international recognition for our 3D printing capability; for example multinational BAE Systems has chosen our LAB 22 as its preferred service provider. Our RAFT[23] technology also gained further industry adoption. Australian company Boron Molecular is now manufacturing RAFT agents at a commercial-scale enabling the company to expand its expertise and manufacturing base.

Our expertise also contributed to the building of three fire refuges to bushfire shelter standards. We are extending the program's lessons with future refuges planned.

### OUR RESPONSE

Our Future Manufacturing Flagship worked with over 1100 manufacturing firms in 2013–14 to develop technologies that enhance productivity, open new markets and product lines, and build long term sustainability.

### FUTURE MANUFACTURING FLAGSHIP ROADMAP

| THEME | 1–3 YEARS | 4–9 YEARS | 10+ YEARS |
|---|---|---|---|
| **Titanium technologies** | With industrial partners, advance technology readiness for new titanium production and manufacturing processes. | Commercialise new processes and guide technologies to production levels, manage and strengthen industry relationships. Build direct manufacturing capability for domestic industry. | Creation of a world-scale titanium industry for Australia. |
| **Flexible electronics** | New materials discovery, device prototype optimisation, ruggedisation and scale-up. | Translate discoveries to create vibrant manufacturing industries based on flexible electronics. | Creation and growth of world-leading Australian companies in flexible electronics. |
| **Manufacturing technologies for transport and mining** | Further development of background intellectual property and scoping studies for key technologies for application in transport and mining. | Feasibility studies and first steps toward large-scale commercialisation of key technologies for application in transport and mining. | Large-scale commercialisation of key technologies for application in transport and mining. |
| **Sustainable high performance materials** | Develop sustainable and high performance materials for the aerospace, defence, civil infrastructure and technical textile sectors. | Materials with improved performance being used in manufacturing operations to produce new products. | Growth in world-class manufacturing based on new, more sustainable, higher performing materials. |
| **Agile manufacturing** | Develop and demonstrate the applicability of ICT-enabled and sustainable process technologies to improve firm productivity, safety and sustainability. | Grow partnerships that integrate, validate and extend ICT-enabled and sustainable process technologies as a mechanism of improving firm profitability. | Recognised leader in the development and integration of leading-edge ICT-enabled and sustainable process technologies that improve firm agility and competitiveness. |
| **Australian Biotechnology Growth Partnerships**[24] | Translation of new processes to enable SME growth to meet global markets. | Continue to engage with companies to provide growth opportunities and commercial competitiveness. | New chemical and biological manufacturing processes for the next generation of high-value Australian companies. |
| **Biomedical materials and devices**[24] | Develop new biomedical polymers and coatings for application in the biomedical manufacturing sector. | Build value for and create new Australian companies in the biomedical manufacturing sector. | Contribute to the growth of the Australian biomedical manufacturing sector. |
| **Infrastructure technologies**[24] | Establish new bushfire test methods. Extend fire/smoke detection capability to ISO international standards. | Establish room-scale test facility and apply to research on improved understanding of sprinkler response impact. | Improved community response to safety and amenity, lower conformity costs and reduction of technical trade barriers. |

● Progress to 2012–13 ● 2013–14

23 Reversible Addition Fragmentation chain Transfer.

24 This Theme was integrated into the Flagship on 1 July 2013. Previous year comparison is not possible.

**GOAL: TO CREATE $2 BILLION OF ADDITIONAL ANNUAL VALUE FOR AUSTRALIA'S MANUFACTURING INDUSTRY BY 2025 THROUGH THE DEVELOPMENT AND APPLICATION OF RESOURCE EFFICIENT, CLEAN AND TRANSFORMATIONAL TECHNOLOGIES.**

## Breaking down global business barriers

Australia has high skin cancer rates, in fact they are twice those of the United Kingdom and the United States. However, the corals that have adapted to life on Australia's Great Barrier Reef over at least 20,000 years don't get sunburnt.

North Queensland company, Larissa Bright Australia, recognised a market need for a safe, effective, non-irritating sunscreen drawing on nature's models. Further, the company wanted to develop a new filter that met broad spectrum guidelines. Intrigued by the corals' properties, the company made the decision to invest in developing a sunscreen that mimics the natural sunscreens of coral.

Through Enterprise Connect's Researcher in Business program, CSIRO partnered with Larissa Bright Australia to enable the creation of the world's first UVA/UVB sunscreen filters to copy the natural sun protection used by Great Barrier Reef corals.

The achievement builds on work by scientists at the Australian Institute of Marine Science, who were the first to discover the natural sun-screening ability of this resource.

The key to the success of the project has been adapting the coral's sunscreen code so it can be safely used as an ingredient in a product for humans.

Outcomes from our partnership include the creation of a patent-pending filter technology. For Larissa Bright Australia this has opened the door to a global sunscreen market valued at over US$6 billion per year.

The broad spectrum coral sunscreen filters are expected to be available to consumers across the globe within five years. The company is now looking for a commercial partner to incorporate the new technology and bring the compounds into full-scale production.

**Coral on the Great Barrier Reef is providing the insight into an innovative sunscreen technology that has global potential. Image: shutterstock.com**

# Minerals Down Under Flagship

## Analysis of performance

### THE CHALLENGES

The Australian minerals industry faces fluctuating metal prices, declining ore grades, rising production costs, environmental pressures and increasing global competition. Science and technology solutions are needed across the minerals value chain to help enable the long-term sustainability of Australia's resource base, industry and economy.

### OUR RESPONSE

Our Minerals Down Under Flagship is supporting the Australian iron ore industry with the introduction of new products and ore blends to the market through ore characterisation and pilot-scale sintering studies. Our research has enabled companies to obtain premium prices for their new products, thereby increasing sales revenues by hundreds of millions of dollars per year.

The CSIRO Chile International Centre of Excellence in Mining and Mineral Processing continues to work with industry and our Chilean partners on issues of joint national significance to the mining industry, including safety, water and energy solutions. This provides a platform for further collaborative research with CSIRO and Latin America.

### OUR PATHWAYS TO IMPACT

CSIRO spin-off Virtual Curtain has commercialised a new environmentally-friendly, cost-effective process for treating mine wastewater that reduces sludge by up to 90 per cent and does not require large infrastructure.

With partners Bluescope Steel and Arrium, a new low-emission steelmaking process was proven at pilot-scale and plans for full-scale operation are under development. The process could increase productivity, halve carbon dioxide emissions, reduce energy use and save 1000 litres of water per tonne of slag for the global steel industry.

Developed with Barrick Gold Corporation, a safe, non-toxic method for processing gold was successfully demonstrated at pilot-scale and prepared for full-scale production. This is the first commercial operation of this technology, which has the potential to open up global opportunities in gold processing.

### MINERALS DOWN UNDER FLAGSHIP ROADMAP

| THEME | 1–3 YEARS | 4–9 YEARS | 10+ YEARS |
|---|---|---|---|
| **Discovering Australia's mineral resources** | Identify new exploration tools. Enable data interoperability. Build multi-party collaborations. | New 3D exploration tools developed and applied to buried deposits and new Greenfield sites. | 3D visualisation, modelling and targeting embedded as an industry standard leading to new discoveries. |
| **Intelligent mining and online analysis** | Engagement with industry to develop innovative mining concepts. Collaborative projects for concept development in online analysis. Technology trials with industry. | Field trials of novel automated continuous selective mining systems and integrated light weight drill systems. Industry partnerships for platform development. Spin-offs and commercialisation. | Adoption of new drilling, rock extraction and sorting systems. A vibrant mining equipment technology and services sector. Online analysis embedded in Australian operations with significant efficiency gains and reduced cut-off grades. |
| **Advanced processing technologies** | Laboratory testing of new ore characterisation, ore concentration and mineral/metal extraction techniques. | Continuous improvements of existing plant. Pilot plant and field trials of new techniques. | New ore reserves on-stream. In-situ leaching viable. Australian mineral processing technology preferred. |
| **Sustainable metal production** | Develop concepts to reduce greenhouse gas and water use. Develop infrastructure for precision iron ore and coke characterisation. Large laboratory testing of new light metal processes. | Proof of concept for new eco-efficient technologies. Beneficiation and agglomeration process improvements resulting in efficiency gains. Pilot plants for new metallurgical processes. | Adoption of new metal production processes. Low-grade iron ores gaining traction in the Australian export market. Australia's light metal industries are global leaders in efficiency. |
| **Australia's mineral futures** | Assess the implications of plausible futures for the industry to 2040. | New planning tools to support social license to operate. | Social negotiation tools embedded in technology and project development. |

● Progress to 2012–13 ● 2013–14

**GOAL: DELIVERING SCIENCE AND TECHNOLOGY OPTIONS FOR THE DISCOVERY AND EFFICIENT DEVELOPMENT OF AUSTRALIA'S MINERAL RESOURCE ENDOWMENT THAT LEAD TO $1 TRILLION *IN-SITU* VALUE BY 2030 AND ENABLE FLOW-ON BENEFITS TO THE WIDER NATIONAL ECONOMY.**

## 'Green' approach to wastewater management shapes future mining

Around the world the minerals industry is seeking more effective ways to manage wastewater and reduce its environmental footprint.

Mine sites require water for many purposes, including mining, mineral processing and dust control. After use, the wastewater is often treated and safely released to the environment.

Our Minerals Down Under Flagship has developed methods to assess the potential impacts, including toxic effects, of wastewater management practices on the environment. These methods are helping the industry improve both economic and environmental outcomes through better mine site closure planning and rehabilitation strategies.

In 2013, the Flagship completed a major research study to underpin Energy Resources of Australia's closure plan for the Ranger Uranium Mine in the Northern Territory. The mine is surrounded by, but separate from, the World Heritage-listed Kakadu National Park and accounts for the majority of Australia's uranium production.

The Flagship provided scientific advice on the long-term geochemical stability of fluids and sediments within a major waste repository at the mine. This involved examining how the residues interacted with groundwater and rainfall and predicting how contaminants within the waste repository may behave and interact with the landscape over thousands of years.

The results confirmed that closure planning for the waste repository was environmentally sound and regulatory approval was subsequently granted.

This study is enabling Energy Resources of Australia to manage Ranger Mine activities in a way that sustains operations while seamlessly planning for the ultimate closure of the site.

Through this work, CSIRO is helping the mining industry achieve more sustainable outcomes for Australia and also building the community's confidence in modern mining environmental management practices.

**CSIRO research is improving environmental outcomes and the protection of World Heritage-listed Kakadu National Park. Image: iStock**

# Preventative Health Flagship

## Analysis of performance

### THE CHALLENGES

Australia has some of the highest incidence rates in the world for colorectal cancer and obesity. Alzheimer's remains a significant health challenge and our ageing population will see more than 700,000 Australians living with the disease by the middle of the century.

### OUR RESPONSE

During 2013–14, our Preventative Health Flagship focused on translating research into health outcomes, working with industry partners on the commercialisation of diagnostic tools and weight management programs.

With our Australian Imaging, Biomarkers and Lifestyle study partners, we engaged pharmaceutical and pathology stakeholders to generate screening tools for those most at risk of developing Alzheimer's disease. In particular, retinal scan technology is showing significant promise as a non-invasive, population-level screening instrument.

Funding from the BUPA Foundation is supporting the clinical evaluation of a second blood test for colorectal cancer, based on a panel of blood protein biological markers. Using samples and data from colonoscopy clinics in Adelaide, the research will provide an important comparison between the protein-based blood test and the current faecal immunological screening test.

### OUR PATHWAYS TO IMPACT

The Aspirin in Reducing Events in the Elderly study is examining the effects of low-dose aspirin to determine if it may help older people to live well for longer by delaying the onset of illness. In June 2014, the biobank reached its initial target of 10,000 Australian participants, complementing the 4000 samples already collected in the United States.

**200 AUSTRALIAN PHARMACIES LAUNCHED A NEW WEIGHT AND HEALTH MANAGEMENT PROGRAM DEVELOPED BY CSIRO AND PROBIOTEC.**

The Flagship developed a new weight and health management program with commercial partner Probiotec. *Impromy*™ was launched in May in over 200 pharmacies around Australia. CSIRO research and expertise led to the development of *Impromy's* service model, which includes a mobile phone application, consultant training program and decision support tool for pharmacy consultants. *Impromy* captures anonymous point-of-care health data that will provide important information on the health and economic benefits of the program.

### PREVENTATIVE HEALTH FLAGSHIP ROADMAP

| THEME | 1–3 YEARS | 4–9 YEARS | 10+ YEARS |
|---|---|---|---|
| **Colorectal cancer and gut health** | New knowledge, early detection and prevention of colon and rectal cancer and inflammatory bowel disease. | Translation into marketable diagnostics and protective foods. | Reduced morbidity and mortality from colon and rectal cancer and inflammatory bowel disease in Australia. |
| **Brain health** | New knowledge about the aetiology and early detection of neurodegenerative disease. | Develop and commercialise neuro protective agents and biomarkers for early detection and prevention. | Delay the onset of Alzheimer's and other neurodegenerative diseases in Australia by five years. |
| **Obesity and metabolic health** | New evidence based strategies for healthy weight – determinants to translation. | Identify determinants of obesity and develop, substantiate and implement diet and lifestyle programs for metabolic health. | Healthy lifestyles and eating behaviours, reduced impact of obesity and its complications. |

● Progress to 2012–13 ● 2013–14

**GOAL: TO IMPROVE THE HEALTH AND WELLBEING OF AUSTRALIANS AND SAVE $2 BILLION IN ANNUAL DIRECT HEALTH COSTS BY 2020 THROUGH THE PREVENTION AND EARLY DETECTION OF CHRONIC DISEASES.**

## Australian first for cancer screening

Globally, colorectal (bowel) cancer is the second most commonly diagnosed cancer in women and the third highest in men. Surgery provides a very effective means of treatment; if detected early, five-year survival rates can be as high as 95 per cent.

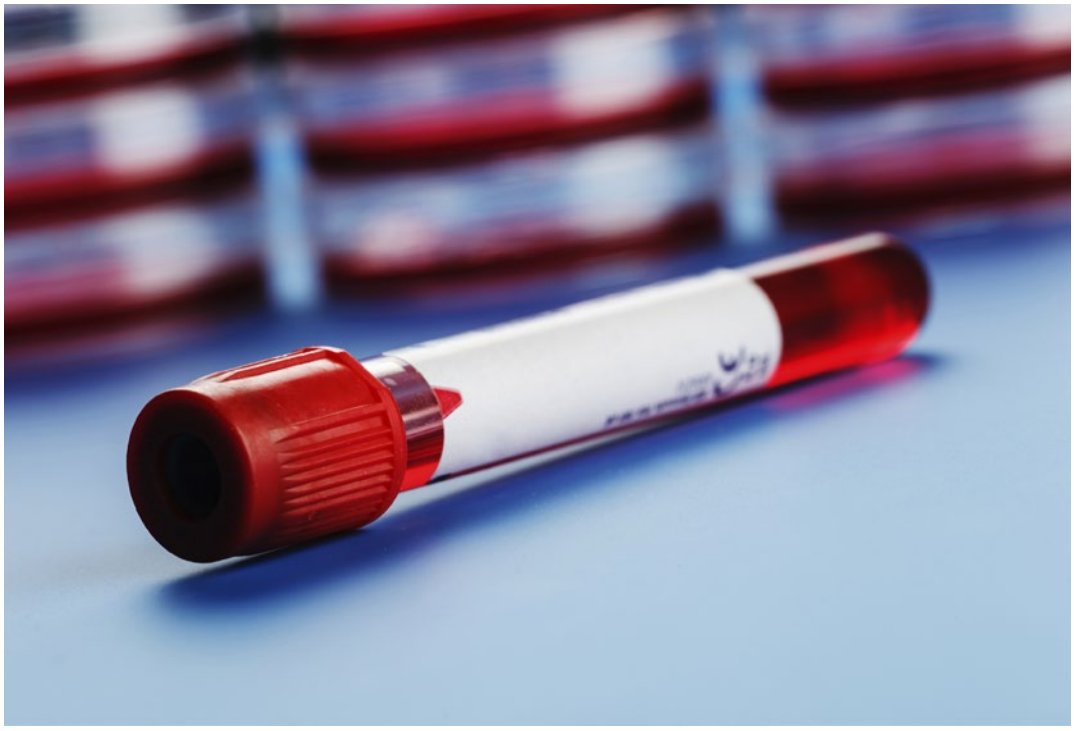
Screening is vital in detecting early-stage cancers, which can be readily removed during colonoscopy. The National Bowel Cancer Screening Program uses the faecal immunochemical test to identify at-risk subjects. However, only 35 per cent of people invited to screen participate in the program. There is a real need for a cancer-specific, more acceptable test for bowel cancer.

Working in collaboration with partners Clinical Genomics and the Flinders Centre for Cancer Innovation, CSIRO embarked on a research program to develop a blood test for the disease. The culmination of more than 15 years of research across multidisciplinary teams is a new test, offering an alternative for people who, for personal or cultural reasons, choose not to use the in-home faecal test.

The blood test is currently being introduced in Australia and the United States. It is expected that if ten per cent of non-compliant screening program participants in Australia use the new test, at least 4000 additional diagnoses will result. This has the potential to significantly reduce long-term cancer cases and save hundreds of lives every year.

**NEW COLORECTAL CANCER TEST TO LAUNCH NATIONALLY.**

The project highlights the benefits of engagement between scientific organisations and small research enterprises, delivering long-term economic and social benefits to Australia. Furthermore, a successful market introduction of the test will be a considerable boon for Australian science and its translation into global health outcomes.



**The new blood test being rolled out in Australia and the United States aims to significantly increase screening rates of bowel cancer. Image: iStock**

# Sustainable Agriculture Flagship

## Analysis of performance

### THE CHALLENGES

Demand for food production will significantly increase over the next 30 years due to increasingly constrained and contested land, water, nutrient and energy resources. The impact of climate change also means the food security challenge has to be met while reducing the greenhouse gas load on the atmosphere.

### OUR RESPONSE

Our Sustainable Agriculture Flagship provides significant value to nationally-coordinated programs addressing water and nutrient use efficiency in grain enterprises, integrated pest management, mixed cropping-grazing productivity and irrigation management. We are the custodians and developers of new technology and key knowledge infrastructure for Australia's agricultural landscapes and food systems, and led new global partnerships in vegetation, soil, landscape and socio-economic mapping and modelling.

### OUR PATHWAYS TO IMPACT

The Flagship delivered carbon emissions reduction and assessment techniques and accounting methodologies, particularly for the Australian Government's Carbon Farming Initiative. Three of the first methodologies approved under the Initiative are grounded in CSIRO expertise. Of the 1.5 megatonnes of carbon dioxide equivalent that has been offset by approved land-based offset projects, 44 per cent has been directly enabled by CSIRO research.

This year culminated decades of work with partners to scale-out remote sensing expertise from the Australian National Carbon Accounting System to Indonesia. This is the system of choice for the United Nations. CSIRO has worked with the Indonesia-Australia Forest Carbon Partnership since 2009 to develop and implement Indonesia's National Carbon Accounting System.

### SUSTAINABLE AGRICULTURE FLAGSHIP ROADMAP

| THEME | 1–3 YEARS | 4–9 YEARS | 10+ YEARS |
|---|---|---|---|
| **Reducing net greenhouse gas emissions while increasing storage of new carbon in our lands.** | Develop greenhouse gas mitigation practices and technologies, measurement, accounting and bio-sequestration options. | Total system greenhouse gas outcomes for different management, history, climate and soil combinations quantified with defined uncertainty and co-benefit assessment. | New carbon sinks and mitigation practices created within profitable and sustainable agricultural system. |
| | Support national policy decisions on land use management for carbon storage and greenhouse gas mitigation. | Conduit for science and integration for industry and government. | National dialogue, policy and action are informed by robust science. |
| **Advancing agricultural productivity and environmental health.** | Identify challenges and prospects for food and fibre productivity increases in key industries, regions and systems. | Direct links between genetics, breeding and farming systems research underpin accelerated improvements in food and fibre productivity. | Step-change in productivity achieved via industry adoption of agro-ecological innovations for 'smart' food and fibre production systems. |
| | Characterise resource and labour-use, soil and water constraints to sustained productivity. | Integrated whole-farm analyses support diverse sustainable enterprise options for efficient resource management. | More sustainable production practices adopted with enhanced resources-use efficiency. |
| | Evaluate agro-ecological tradeoffs in farming systems to improve productivity and natural resource management outcomes. | Assess environmental impacts of emerging productivity and mitigation practices, technologies and policies. | New markets developed and in use for effective on-farm environmental and biodiversity stewardship schemes. |
| **Informing land use planning, policy and natural resource management.** | Observation of current status and historic change in key land management drivers. | Develop life-cycle based sustainability assessments for agri-food value chains. | Multi-scale temporal assessment of land use change. |
| | Enhance national soil and terrain data systems. | Triple-bottom-line modelling framework for land use systems. | International system for forest and carbon tracking. |
| **Addressing global food and fibre security challenges through partnerships at home and abroad.** | Deliver enhanced science and impact via an integrated approach to international project portfolio. | Deepen partnerships with international R&D institutions leading to enhanced capacity building. | Monitoring and evaluation confirm realised sustainable livelihood benefits in target regions. |

● Progress to 2012–13 ● 2013–14

**GOAL: TO SECURE AUSTRALIAN AGRICULTURE AND FOREST INDUSTRIES BY 2030 THROUGH A 50 PER CENT INCREASE IN PRODUCTIVITY AND A 50 PER CENT REDUCTION IN CARBON EMISSIONS INTENSITY, WHILE ENHANCING THE RESOURCE BASE AND PARTNERING FOR GLOBAL BENEFIT.**

## On the moooove: improving livestock transport

Northern Australia's beef herd is around 12.5 million cattle, making up 90 per cent of Australia's live cattle exports. Moving northern Australia's cattle from farm to market can involve the longest land transport distances of any Australian commodity, with Northern Territory cattle often travelling over 1000 kilometres. The costs are up to 35 per cent of the market price of livestock.

The Sustainable Agriculture Flagship set up a project called Livestock Logistics to look at ways to improve efficiencies, reduce costs and identify opportunities for new development in northern Australia.
The project developed a series of modelling tools that have already started to be used to identify ways to reduce transport costs by more than $15 million per year in some regions.

These tools incorporate information from more than 50,000 cattle properties in northern Australia, and map more than 88,000 possible pathways from property gate to end destination. The set of tools can identify cheaper transport options, allow for seasonal variations like roads closed by flooding, and also highlight opportunities for new development, such as road upgrades or construction of new abattoirs and port infrastructure.

During development, these tools were trialled by industry to identify and evaluate six options for reducing costs in the north. One option included upgrading the 510-kilometre road corridor between Clermont and Roma in Queensland to accommodate larger road trains. The tools show this development could save transport companies $15 million per year. These new tools will also assist any review and planning by providing scenario testing that takes into account actual cattle flows to various markets and ports.

**$15M** **PER YEAR OF POTENTIAL SAVINGS TO TRANSPORT COMPANIES.**

Since the tools were made available to the rest of industry and government in 2014, three new clients have adopted them, including Meat and Livestock Australia, Flinders Shire Council and the Queensland Government.


**Moving livestock across northern Australia involves some of the longest distances of any commodity in Australia, with average distances more than 1000 kilometres. Image: iStock**

# Water for a Healthy Country Flagship

## Analysis of performance

### THE CHALLENGES

Water security is a global issue and is fundamental to human development and international security. In Australia, population growth, a drying southern climate and land use change have pushed river systems and water storages beyond their limits, threatening water security and creating challenges for water managers, industry, policy makers and the community.

### OUR RESPONSE

Our Water for a Healthy Country Flagship provides an integrated, multidisciplinary approach, coupled with strategic partnerships, to deliver science-based knowledge to improve water management in regional and urban environments and enable improved water security – at national and international scales.

With partners we commenced research to inform the Australian Government's Bioregional Assessments program on potential impacts of coal seam gas and large coal mining developments on water resources and water dependent assets.

Internationally, we continued to engage with government and industry in South Asia to address trans-boundary water management challenges, including piloting the *Source* modelling system in the Koshi River basin that runs through China, Nepal and India.

The Flagship identified critical pollutant sources in all 35 Great Barrier Reef major catchments across 430,000 square kilometres. We also contributed to the 2013 Scientific Consensus Statement on water quality in the Great Barrier Reef which informs government efforts towards improved water quality.

### OUR PATHWAYS TO IMPACT

Through our Water Information Research and Development Alliance with the Bureau of Meteorology, the streamflow forecasting service now covers over 70 sites nationally. This informs critical water planning and management decisions and has been used on the Cotter Dam expansion in Canberra and the Victorian Government's water catchment allocations.

Our research on managed aquifer recharge directly informed the Water Corporation of Western Australia's decision to upscale groundwater replenishment at Beenyup from 1.5 gigalitres per year to 28 gigalitres per year by 2022. This has the potential to save Water Corporation and customers $1 billion by 2030 and deliver 105 gigalitres per year (20 per cent of Perth's drinking supply) by 2060.

### WATER FOR A HEALTHY COUNTRY FLAGSHIP ROADMAP

| THEME | 1–3 YEARS | 4–9 YEARS | | 10+ YEARS |
|---|---|---|---|---|
| **Urban water** | Develop new approaches for sustainable integrated urban water management. | Inform state and national urban water policies. | New decision support systems and technologies to deliver sustainable integrated urban water services. | Provide acceptable, affordable, environmentally beneficial solutions for urban water systems. |
| **Integrated water resources management** | With the Bureau of Meteorology, develop water reporting and forecasting tools to improve real-time monitoring. | Enable water information interoperability through research. | Widely accessible and used national water information tools and network based on open standards. | Combine forecasting information with integrated models to support whole-of basin water management. |
| **Ecosystems and contaminants** | Develop and embed integrated models and evaluation tools in adaptive management of priority water ecosystems. | Inland and coastal water ecosystems managed through the use of integrated knowledge platforms. | Significantly reduced long-term impacts of pollutants and changed flow regimes in priority water ecosystems. | Provide the knowledge to protect or restore major water ecosystems while enabling sustainable use of water resources. |
| **Water resource assessment** | Improve water efficiency and sustainability through advanced surface and ground water management options. | Enable improved institutional water use arrangements and evaluate their economic, social and environmental impacts. | Improve water security and productivity through integrated management of river basins and aquifers. | Provide systems knowledge and tools for river basins and aquifers to ensure water security for all users. |

Progress to 2012–13 2013–14

**GOAL: CONSISTENT WITH AUSTRALIA'S NATIONAL INTEREST, DEVELOP SCIENCE AND TECHNOLOGIES THAT IMPROVE THE SOCIAL, ECONOMIC AND ENVIRONMENTAL OUTCOMES FROM WATER AND DELIVER $3 BILLION PER YEAR IN NET BENEFITS FOR AUSTRALIA BY 2030.**

## Guiding the development of sustainable agriculture in northern Australia

Increasing concerns about water availability and climate-based threats to food and fibre production in southern Australia have re-directed attention towards the potential use of northern water resources for the development of agriculture in northern Australia.

In January 2012, the Australian and Queensland Governments established the North Queensland Irrigated Agriculture Strategy to assess the opportunities and challenges of increasing agriculture in the north. The major component of the Strategy was the Flinders and Gilbert Agricultural Resource Assessment (FGARA). These catchments occupy an area of 160,000 square kilometres and, based on the assessment, could increase northern Australia's irrigated production potential by about 30 per cent.

**ASSESSMENT FINDS THE FLINDERS AND GILBERT CATCHMENTS COULD INCREASE IRRIGATED PRODUCTION POTENTIAL BY 30%.**

Led by CSIRO and involving more than 100 specialists from diverse disciplinary backgrounds and organisations, FGARA provides the fundamental knowledge needed to support future sustainable agricultural development decisions across northern Australia.

The assessment, completed in 2014, identified and evaluated water capture and storage options and also identified and tested the commercial viability of irrigated agricultural opportunities. It also examined the potential environmental, social and economic impacts and risks of such development.

It also addressed the barriers to investment in regional development. It explicitly looked at local needs and aspirations, meeting the needs of governments as they regulate the sustainable and equitable management of public resources with due consideration of environmental and cultural issues. It also met the due diligence requirements of private investors by addressing questions of profitability and income reliability at a broad scale.

The findings were released by the Australian Government in February 2014 and are informing policy and planning decisions at both state and federal levels, including the revision of the Queensland Government's Water Resources (Gulf) Plan. Private investors are also utilising the assessment's approach and findings.

**Tonks Camp on the Gilbert River is located within the Gilbert catchment which has the potential to significantly contribute to northern Australia's agricultural productivity.**

# Wealth from Oceans Flagship

## Analysis of performance

### THE CHALLENGES

Ocean-based industries such as oil and gas, fisheries, transport and tourism contribute over $42 billion a year to the Australian economy. By 2025, this is projected to increase to more than $100 billion. The oceans and coasts also drive the climate system, provide food, sustain biodiversity, and offer recreational and lifestyle opportunities. The management of multiple uses for our oceans and coasts is a key challenge for government, regulators and managers, industry and the community.

### OUR RESPONSE

Our Wealth from Oceans Flagship has a formal agreement with the Australian Maritime Safety Authority (AMSA). This agreement has resulted in the creation of a comprehensive safety and preparedness oil spill kit, enabling immediate deployment of CSIRO technology in the event of a marine incident, such as an oil spill or shipping accident. The data we collect and analyse informs AMSA's countermeasure strategies during such events, and are ensuring science-based decisions are made to protect the environment and community.

Through our international research collaborations, further breakthrough discoveries were made about our ocean climate system, enabling us to predict extreme weather events three to six months in advance. Our modelling indicates that extreme weather events are set to double over the next decade.

### OUR PATHWAYS TO IMPACT

In 2013–14, the Flagship delivered the first of a series of ecosystem baseline studies of the World Heritage-listed reef ecosystem in the Pilbara of Western Australia. This study is helping to inform government and industry in balancing the environmental sustainability of the region with increasing broad-sector use.

**WE'VE DELIVERED THE FIRST OF A SERIES OF STUDIES OF THE WORLD HERITAGE-LISTED REEF ECOSYSTEM IN THE PILBARA OF WESTERN AUSTRALIA.**

In March 2013, the Flagship's collaboration with research agencies and industry delivered the eReef Marine Water Quality Dashboard, which is now being used by reef managers and government to obtain timely information on water quality indicators such as temperatures and sediments for the Great Barrier Reef.

Our stock assessment methods and harvest strategies have contributed to a significant reduction in overfishing in Commonwealth managed fisheries. A recent independent evaluation estimated this research generates over $300 million per year in the long term.

### WEALTH FROM OCEANS FLAGSHIP ROADMAP

| THEME | 1–3 YEARS | 4–9 YEARS | 10+ YEARS |
|---|---|---|---|
| **The dynamic ocean** | Synoptic forecasting system for major marine industries delivered (BLUElink 3). | Deliver littoral zone forecasting system for defence and industry applications. | National, seamless near-real ocean prediction and forecasting system operationalised. |
| **Our resilient coastal Australia** | Coastal management strategy evaluation system implemented and operational in three regions nationally. | Integrated observation modelling and visualisation system (eReefs) guiding management of the Great Barrier Reef Marine Park. | Regional shelf-scale hydrodynamic model nationally implemented and used for oceanographic services. |
| **Sustainable ocean ecosystems and living resources** | CSIRO R&D underpinning marine bioregional plans and National Representative System of Marine Protected Areas. | Adoption of CSIRO marine incident emergency response system and implementation of offshore oil and gas research strategy for improved policies and regulations for offshore oil and gas industries. | Operationalisation of a National Ocean and Coastal Information System, as part of Australia's National Environmental Information System. |

● Progress to 2012–13 ● 2013–14

**GOAL: TO PROVIDE AUSTRALIA WITH THE KNOWLEDGE AND TOOLS TO PROTECT COASTAL AND OCEAN ENVIRONMENTS, INCREASE THEIR VALUE TO SOCIETY AND CREATE A NET ECONOMIC BENEFIT OF $3 BILLION PER ANNUM.**

## Missing planes to oil spills: the science of marine incident response

Science is a crucial part of modern day incident and disaster response. When disaster does strike, our Wealth from Ocean Flagship's routine data collection, modelling and analysis provides a platform for the science-based decision-making required to guide operations.

The Flagship has a Memorandum of Understanding with the Australian Maritime Safety Authority that facilitates the provision of scientific knowledge and technical support during maritime incidents, such as oil spills, search and rescue and shipping accidents.

In 2014, the Flagship's partnership was called upon to assist in the search for missing Malaysian Airlines flight, MH370. The support involved modelling and projecting the track of any potential debris spotted by satellites and planes during the initial search in the Indian Ocean.

The debris tracking used advanced models of ocean currents around Australia developed through BLUElink – a collaboration between the Flagship, the Bureau of Meteorology and the Australian Navy over the past decade – to determine likely movement of (potential) wreckage or to backtrack to a crash site.

These same models are used to track and project oil spills, missing boats, valuable fish stocks and guide Navy operations. With oil spills, our science extends to monitoring technologies, plus environmental and ecosystem models and data.

As demonstrated with our partnership with BP in the Great Australian Bight, the science begins well before any exploration takes place. This year, in the Bight region, we began baseline monitoring of the ecosystem and biodiversity, socio-economic research with the community and related industries, oceanography and geochemistry analysis.

The science we carry out before, during and after any incident informs the readiness, response and subsequent monitoring of an incident, with the overall aim of minimising harm to people and the environment.

**The Flagship's ocean modelling and data informed the search for MH370. Image: Department of Defence**

# Program 2
## Core Research and Services

Our core research and services improve industry, environment and community wellbeing across the breadth and depth of the National Innovation System[25]. We do this through the provision of advice, information and solutions.

### OBJECTIVES AND DELIVERABLES

The objectives of our core research and services include the delivery of new and improved technologies, management systems, intermediate and final products, catalyst services for business, advice relevant to policy development and new knowledge and skills. Each of our core research Groups are led by a Group Executive and all Groups are committed to pursuing their objectives through partnerships in private and public sectors both within Australia and internationally.

Our ability to deliver profound impact through our National Research Flagships is underpinned by investment in our core research capabilities that build strength in areas of national need, ensuring that Australia has the knowledge and skills to respond to national and international challenges. See page 30 for Program 1 – National Research Flagships.

### PROGRAM PERFORMANCE

This year, our Core Research and Services Program continued to perform well. An assessment of the Program's four key performance indicators (KPIs) identified in the Portfolio Budget Statements, showed we have met expectations and targets. Table 2.4 provides an overview of the evidence for each KPI with a more detailed analysis following.

**TABLE 2.4: PERFORMANCE INDICATORS FOR PROGRAM 2 – CORE RESEARCH AND SERVICES**

| KEY PERFORMANCE INDICATOR | TARGET (AND PERFORMANCE ASSESSMENT) | PERFORMANCE |
|---|---|---|
| Demonstrated adoption and impact of core research outputs | Grow economic, social, environmental and intangible benefits | In 2013–14, we supported approximately 200 SMEs. Our overall total equity portfolio increased by $4.1 million. At June 2014 we had 644 patent families, 257 trade mark families, and 91 different Plant Breeders' Rights. Twenty-six per cent of our patent portfolio is commercially licensed. Most of the licences generating revenue were to Australian companies, with one third international entities. We saw a decrease in new inventions and corresponding Patent Cooperation Treaty (PCT) applications. Further evidence of adoption and impact for each of our Groups is reported on pages 66 to 75. |
| Customer satisfaction | Maintain | This year is the second year of our client satisfaction survey. We maintained our performance with results showing an average 'willingness to recommend' score of 8.6 out of 10 (up from 8.5). See Program 1 for details. |
| Number of refereed Core Research publications | Maintain or increase | Refereed journal publications increased from 2842 in 2012 to 3111 in 2013. CSIRO maintained its rank in the top 0.1 per cent of global institutions in Plant and Animal Sciences, Agricultural Sciences, Environment and Ecology, and Geosciences (based on total citations). |
| Science excellence in CSIRO research capabilities as assessed through a rolling program of rigorous peer review | Maintain or increase | Five Divisional Capability reviews were conducted in 2013–14: Materials Science and Engineering, Land and Water, Ecosystem Sciences, Plant Industry, and Animal, Food and Health Sciences. Overall the quality of science was regarded as high and the translation of its value into projects of significance acknowledged. The Panels recommended areas for further opportunity including stakeholder engagement and synergies across the organisation's multiple capability areas. |

**Blue shading**: indicates positive progress for the year and the target has been achieved.

25 Information about the National Innovation System is available in the Australian Innovation System Report at: www.industry.gov.au/science/policy/Pages/AustralianInnovationSystemReport.aspx

## Demonstrated adoption and impact of core research outputs

### *Intellectual property management and licensing*

Intellectual Property (IP) is a key tool for capturing the benefits of our research for Australia, protecting the results of our activity and ensuring our technologies are not inappropriately copied by competitors. Our Intellectual Property Management framework is provided by the *Statement of Intellectual Property Principles for Australian Government Agencies*. It gives guidance and ensures effective identification, protection, ongoing management and exploitation of IP. Strong IP portfolios also provide key positioning in various marketplaces, underpinning our strategy and providing external reputation benefits with clients and potential collaborators and competitors.

### *Intellectual property portfolio*

As of June 2014, CSIRO had 644 patent families, 257 trade mark families, and 91 different Plant Breeders' Rights. We have seen a decrease in the number of new inventions and corresponding Patent Cooperation Treaty (PCT) applications. This apparent decrease in the size of our patent portfolio continues a trend over several years. Some of these downward trends demonstrate an increased focus on a more strategic approach to the management of our patent portfolio, utilising the patent process only for cases where it is likely to achieve the intended impact. Some of the changes observed also relate to changes in Australian legislation, particularly the more stringent requirements around patentability.

**TABLE 2.5: CSIRO INTELLECTUAL PROPERTY PORTFOLIO**

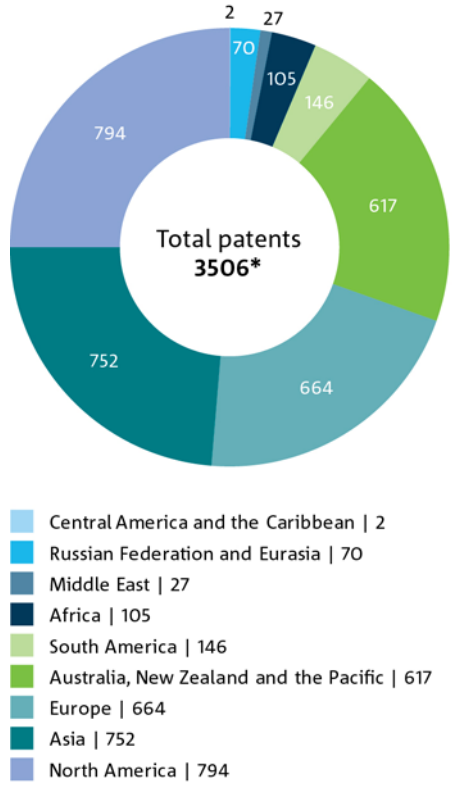
| IP CATEGORY | SUB CATEGORY | 2009–10 | 2010–11 | 2011–12 | 2012–13 | 2013–14 |
|---|---|---|---|---|---|---|
| Patents | Current PCT applications | 90 | 101 | 98 | 83 | 56 |
| | Granted | 1,630 | 1,631 | 1,649 | 1,647 | 1,755 |
| | Live cases | 3,379 | 3,370 | 3,582 | 3,454 | 3,506 |
| Inventions | Patent families | 712 | 709 | 728 | 718 | 644 |
| | New (provisional patents and direct filings) | 99 | 92 | 95 | 87 | 66 |
| Trade marks | Australian | 263 | 259 | 275 | 281 | 257 |
| | Foreign | 114 | 109 | 81 | 88 | 91 |
| Plant breeder's rights | Australian | 122 | 122 | 83 | 87 | 91 |
| | Foreign | 21 | 21 | 39 | 24 | 26 |
| Registered designs | Australian | 2 | 2 | 3 | 3 | 2 |
| | Foreign | 10 | 10 | 8 | 8 | 6 |

Our IP is a valuable asset used to generate short and long-term revenue through licensing, or to attract third party collaborations. Of the IP assets listed in Table 2.5, 26 per cent of our patent portfolio is commercially licensed (to 288 different entities both local and international), and 57 per cent is subject of research rights to third parties. About half the licences that generate revenue relate to licensing of Registered IP rights (Patents, Trade marks and Plant Breeder's Rights). A significant component of licensing revenue was generated by cotton seed and WLAN[26] royalties. The majority of the remaining revenue was generated from copyright and patent licences. Most of the licences generating revenue were to Australian companies, with one third international entities.

Registered Rights are also used as collateral in collaborations or technology evaluations and these types of third party engagements themselves generate new IP that can lead to other licensing opportunities or other collaborations. Currently CSIRO has more than 30 active research collaborations that have patents listed as background IP. Of the 644 current patent families, 195 of them (or 30 per cent) were the result of collaborative activity with 97 distinct external parties. The majority of partners (64 per cent including 40 per cent international) can be characterised as industry partners, 24 per cent SME and large Australian firms. The other partners are Australian research institutes (15 per cent), government bodies (16 per cent) and overseas research institutes (five per cent).

The total number of live patent cases in Asia has been growing steadily over recent years. CSIRO has a large proportion of live patent cases in Asia, with at least 20 per cent in Japan, China, India, South Korea, Hong Kong, Malaysia, Indonesia, Singapore, Vietnam, Taiwan, Thailand and the Philippines (see Figure 2.6). There has also been an increase in the number of filings in South America and Africa, but these regions represent a relatively small portion of our patent portfolio – slightly more than seven per cent. Overall, our spread of patent cases mirrors the geographic regions where we focus our research and its research reach.

**FIGURE 2.6: CSIRO'S LIVE PATENT CASES BY GEOGRAPHIC REGION**




* Includes CSIRO patents yet to be filed in international countries

### *SME Engagement Centre*

Our SME Engagement Centre assists Australian industry by providing tailored support and advice about the National Innovation System to SMEs. This year approximately 200 SMEs were supported with information, connections and facilitation of research projects that allow the company to develop a competitive advantage. Of these, the SME Engagement Centre facilitated 35 projects where a researcher was placed in an SME to collaborate on a technical solution to a company challenge or opportunity. Twenty-six used a CSIRO researcher and nine used researchers from other Australian research organisations. These projects allow for both explicit and tacit knowledge transfer, which helps improve collaboration between SMEs and research organisations. Our SME Engagement Centre won a 2013 Australian Business Award for its innovative approach to bridging the gap between SMEs and research organisations.

26 Wireless Local Area Networks

*Universal Biosensors*

Rowville-based manufacturer Universal Biosensors (UBI) makes hand-held blood-analysis devices for point-of-care testing – the types of instruments doctors and diabetics use to measure blood sugar levels. The company began working with CSIRO through the Researchers in Business program to come up with improved coatings for biosensor test strips used to diagnose and monitor diseases.

The aim is to improve the sensitivity of tests performed using UBI strips. As a result, UBI will be able to offer a broader range of tests that can be easily used by medical practitioners and patients. This will increase their exports and grow their manufacturing business.

Today, we are continuing to work with UBI, supported by the Victorian State Government's Technology Voucher Program, to further develop the research and create superior products that can be taken into the international diagnostics market.

**Blood analysis on-the-spot provides immediate results to doctors and patients. Image: iStock**

### *Australian Growth Partnerships Program*

To support the growth of our IP Portfolio, we place significant focus on strategic engagements and collaboration with industry partners. In 2007, we established the Australian Growth Partnership (AGP) program to increase engagement with Australian SMEs. The AGP program provides funds to high-potential, technology-receptive SMEs so they can access CSIRO research and development capability and IP. It is designed to be mutually beneficial by assisting SMEs to overcome existing technical issues, while contributing to our own National Research Flagships Program.

As at 30 June 2014, six SMEs were engaged in the AGP program, including one new participant. This year $662,000 was invested in two SMEs. There were no company exits from the program during 2013–14.

*Reducing the cost of pain relief*

In 2012, Australian healthcare company Medical Developments International (MDI), received funding through the AGP program for the next generation production of the drug methoxyflurane – the pain-relieving ingredient used in Penthrox (commonly known as the 'Green Whistle'). The aim was to significantly reduce the cost of producing Penthrox and facilitate large-scale production as part of MDI's plan to expand Penthrox sales into the United Kingdom (UK) and Europe.

The project has successfully completed its second stage and has commenced work on the final phase, which involves building of the manufacturing plant and final demonstration of the manufacturing process. MDI has also made excellent progress in the drug registration approval process for Penthrox in Europe. If registration is given, Penthrox will be approved for sale in the UK, France, Belgium and Ireland. Penthrox is manufactured at MDI in South East Melbourne and is currently sold in 11 countries.

**The green whistle (Penthrox) delivers pain relief to patients.**

### *Equity portfolio*

The total value of CSIRO's equity portfolio at 30 June 2014 was $14.6 million across listed and unlisted companies. Our overall total equity portfolio increased by $4.1 million from 30 June 2013. Major contributing factors were the $1.1 million value increase in listed companies and $3 million value increase in unlisted, which also included $1.3 million in new spin-out companies. A total of four portfolio companies were wound up and two new spin-out companies formed during 2013–14. Seven portfolio companies raised over $50 million from capital markets during the year, helping to fund ongoing commercialisation activities.

CSIRO licenses technology to existing companies where it is deemed the most likely route of maximising IP value. However, it also directly creates new high technology SMEs through spinning out IP when that is considered to be the best pathway to commercialisation. Currently CSIRO has interests in 33 companies.

## Number of refereed Core Research publications

The number of refereed CSIRO journal articles has been trending upwards over the last five years (see Figure 2.7), with a nine per cent increase between 2012 and 2013. This is the largest annual increase since 2009–10.

Research publication performance is often measured in the science community by counting citations – the references from one article to another in its bibliography. When one piece of work cites another, this is taken as recognition of value and academic impact. The more citations an article has received, the more impact it has had on its field.

Approximately 55 per cent of all CSIRO publications are produced in its four strongest fields, ranked globally by total citation count (see Figure 2.8). The remaining fields in which we rank in the top one per cent globally are also shown in Figure 2.8. Fundamental changes in the way the data provider assembles its rankings saw CSIRO fall out of the Physics ranking this year.

**FIGURE 2.7: CSIRO PUBLICATION OUTPUT AND CITATION IMPACT**

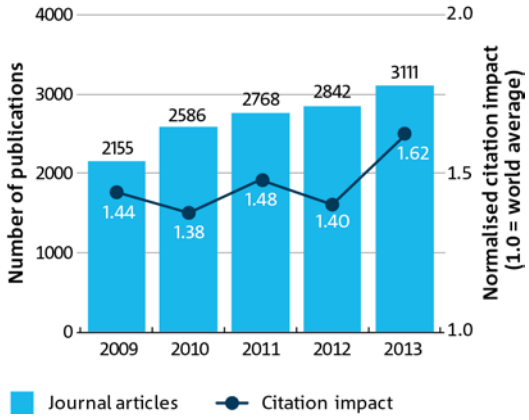
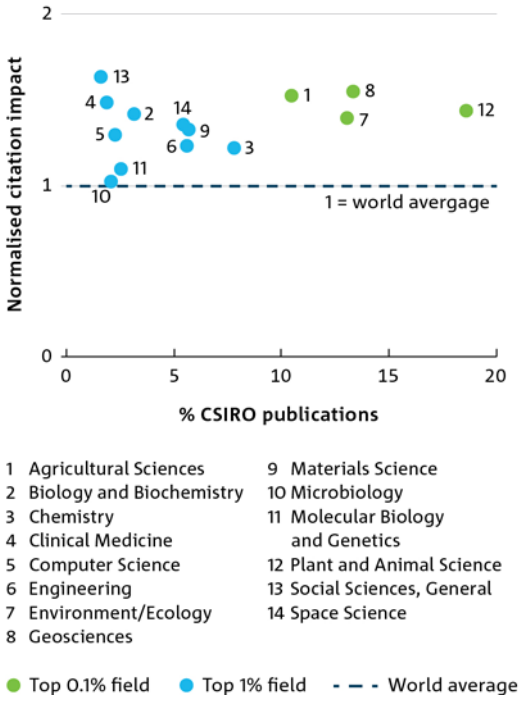



**FIGURE 2.8: CSIRO PUBLICATION OUTPUT AND CITATION IMPACT BY RESEARCH FIELD, 2004–13**



Citations can also be expressed relative to the world average performance, accounting for the age and subject of publications. A result of 1.0 is equal to the global average, 1.2 is 20 per cent more cited and 0.75, 25 per cent less cited (see Figure 2.7). Overall, our citation impact has been improving over the last decade, with CSIRO articles cited performing 47 per cent better than the global average for the period 2009–13. In 2013, performance for the period 2008–12 was reported as 56 per cent better than world average. The apparent drop is due entirely to a complete overhaul of the baselines the data provider requires to generate the metric. When measured using the new baselines, 2008–12 performance was 41 per cent better than world average, meaning our 2009–13 performance is a six per cent improvement. This demonstrates that we are performing competitively and are positioned well against our global peers in terms of science excellence.

Another robust and established metric is to rank articles by citation count based on percentile performance, compared with all other articles of the same type and in the same subject. In 2009–13, 2.8 per cent of CSIRO publications were in the top one per cent of articles globally, 10.2 per cent in the top five per cent and 18.1 per cent in the top ten per cent. All three of these levels improved on the period 2008–12. These results demonstrate that our share of the very best research output is substantially above average and continues to improve.

### *Prestige publications*

A measure of academic esteem is to track the level of an organisation's publications in a small number of the highest-impact journals, including *Nature*, other *Nature* titles, *Science* and the *Proceedings of the National Academy of Sciences*. The number of CSIRO publications in each of these since 2009 are shown in Figure 2.9. This year recorded the highest level in the series.

### *Joint research publications with Australian universities*

Our number of collaborative publications has nearly tripled since 2003. In 2013, 85 per cent of our publications were collaborations with authors from other institutions. Fifty-nine per cent were produced with authors from other Australian institutions.

**FIGURE 2.9: CSIRO RESEARCH PUBLICATIONS IN SELECTED PRESTIGIOUS JOURNALS[27]**

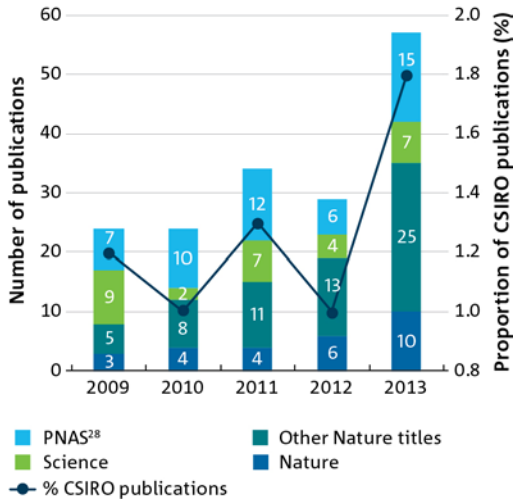


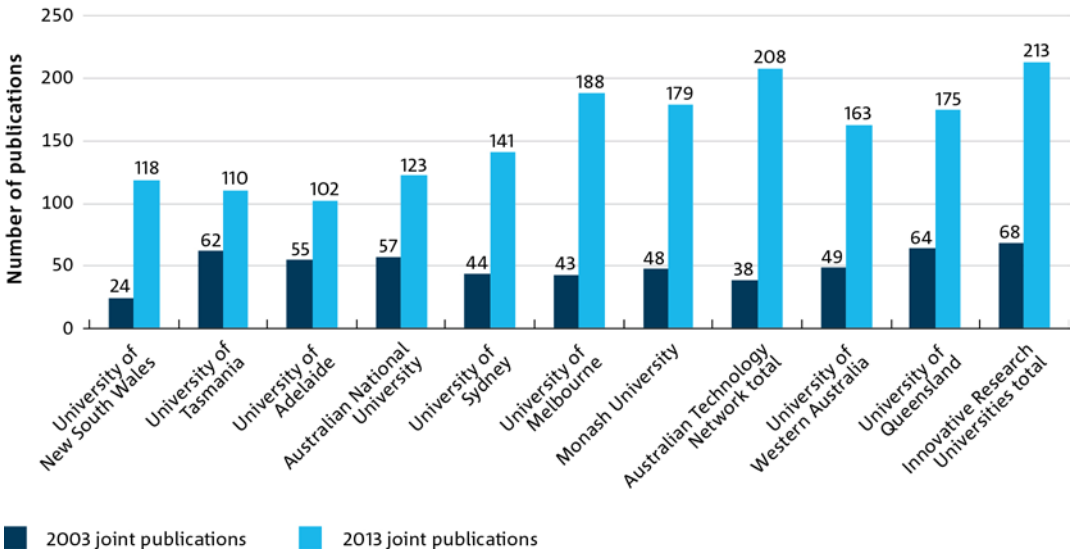

Figure 2.10 shows our collaboration with Australian universities has also increased substantially since 2003 (as measured by joint publications). We continue to collaborate with the Group of Eight universities, with universities in the Australian Technology Network of Universities and with those in the Innovative Research Universities.

**CSIRO IS DEMONSTRATED TO BE THE MOST IMPORTANT ('CENTRAL') INSTITUTION IN THE COUNTRY IN THE SIX FIELDS IN WHICH IT PUBLISHES MOST WORK – AGRICULTURAL SCIENCES, CHEMISTRY, ENVIRONMENT/ ECOLOGY, GEOSCIENCES, MATERIALS SCIENCE AND PLANT/ANIMAL SCIENCE.**

Network analysis can also show our place in Australia's research ecosystem by analysing the relationships among research producers, as measured through their collaborative publications. Applying a common network metric – Eigenvector Centrality – which shows a weighted closeness of the organisation to all other institutions, CSIRO is demonstrated to be the most important ('central') institution in the country in the six fields in which it publishes most work – Agricultural Sciences, Chemistry, Environment/Ecology, Geosciences, Materials Science and Plant/Animal Science.

27 Data source: Web of Science (acquired 15 May 2014); Articles & Reviews, 2009–13
28 Proceedings of the National Academy of Sciences (PNAS)

**FIGURE 2.10: CSIRO JOINT RESEARCH PUBLICATIONS WITH KEY AUSTRALIAN UNIVERSITIES[29]**




### *Joint research publications with other countries*

We have significantly increased the rate of collaboration with organisations overseas, as measured by joint publications. In 2013, 51 per cent of our scientific publications were co-authored with an international author. The top ten countries we have co-published with are, in descending order, the USA, China, England, Germany, France, Canada, Japan, the Netherlands, New Zealand and Italy. Joint publications with institutes in China increased eight-fold between 2003–13. Over the same period joint publications with USA institutions have more than doubled.

**8 FOLD INCREASE IN JOINT PUBLICATIONS WITH INSTITUTES IN CHINA FROM 2003 TO 2013.**

## Science excellence in CSIRO research capabilities as assessed through a rolling program of rigorous peer reviews

A key element in our success is our development and continued maintenance of high-quality scientific capability, including world-class researchers, research infrastructure and collaborative relationships.

A key mechanism that has helped maintain this high standard in research capability is independent, robust and rigorous Divisional reviews every three to five years.

As with our Flagship reviews, the assessments are led by a panel of independent scientific experts (typically two from overseas and two from Australia) whose knowledge and skills provide an appraisal of the capability performance of a Division, as well as suggestions as to how the performance of research teams can be increased[30]. The panels are encouraged to be forthright in their advice.

Five reviews where held in 2013–14. As with Flagship reviews, panels rate each research program for global science quality and probable industry or community impact. When the rankings to-date are combined for the third cycle, the overall interim results indicate that 82 per cent of the research being undertaken was recognised as either setting a new scientific direction or sustaining the position of a scientific leader (quality). Eighty-five per cent was research that enables or sets the standard for commercial, environmental, community or policy development that has real-world application compared with its peers (impact). A summary of the key outcomes from these reviews by Division follows.

29 Data source: Web of Science, Thomson-Reuters
30 See Glossary on page 199 for the Divisional Capability Review Terms of Reference.

### *CSIRO Materials Science and Engineering (CMSE)*

*Date of review: September 2013*

The review panel concluded that CMSE was one of the world's top ten global materials science and engineering research institutions as judged by science quality. They found the capabilities, science directions being pursued, and the way they were being used to drive the Division's work, impressive. The panel noted CMSE's science has the potential to have significant translational impact. It also observed that our RAFT technology is a major lever in developing science and business opportunities. Additionally, the strategy of collaborating with other research organisations was an important mechanism for the Division to build and leverage capability, particularly in a resource constrained environment. It was recognised that the Division and Chief were new and that the Division operates over multiple sites. The panel recommended greater focus and alignment for the future development of the Division.

Stakeholders interviewed during the review highly commended the work of CMSE researchers and their understanding of industry needs and commitment.

### *CSIRO Animal, Food and Health Sciences (CAFHS)*

*Date of review: September – October 2013*

The review panel concluded that the quality of CAFHS research and science is generally strong and benchmark in several areas. It recognised that CAFHS was formed just one year before the review and made recommendations on opportunities to achieve further synergies across the Division, optimising the use of facilities, and suggestions for developing the interaction and engagement with stakeholders. The panel noted that the combination of skills, expertise and facilities has the potential to contribute uniquely to the competitiveness of Australia's agriculture and food industries, particularly in responding to global challenges and opportunities related to food security, population health, biosecurity and food safety.

### *CSIRO Land and Water (CLW)*

*Date of review: December 2013*

The Division was assessed as having strong scientific expertise and capabilities and the science overall was noted to be healthy. The quality of science delivery for industry and the community was described as commanding and the review panel noted that much of CLW's research had been successfully translated into policies and practices.

The panel noted that the Division had a long-term vision of Australia's policy challenges in the water and land domains, and the role it could play in addressing these. CLW also showed long-term commitment to invest resources but the panel noted that, given the economic realities, resourcing levels were lower than some other international R&D organisations. The panel recommended opportunities be explored to maximise the value of stakeholder and collaborator relationships, especially if CSIRO is to continue to be a leader in the nation's water and land science.

### *CSIRO Ecosystem Sciences (CES)*

*Date of review: February – March 2014*

The review panel found the Division has a very strong upward trajectory in terms of its science in both fundamental/discovery science and applied science. It also observed the strong collaborative culture within the Division. It noted that science leadership in some groups was very strong but indicated there was room for improvement in others. It was evident that external stakeholders regard the work of CES with great respect. The panel was also impressed by the strong engagement with Aboriginal and Torres Strait Islander communities across much of its science and with communities more generally.

The panel noted that the Division was unique in several ways. Its research bridges social, economic and biophysical sciences in ways not commonly encountered elsewhere. CES is also home to some unique resources (collections, data sets and models) which underpin quality science. The panel recommended the Division explore opportunities to deliver the full potential for scientific advancement through its diverse and multidisciplinary capabilities and resources through active engagement with other research areas following our restructure.

### *CSIRO Plant Industry (CPI)*

*Date of review: May 2014*

The review panel noted the prominent role of the Division in plant science and agriculture research in Australia and its substantial contribution to international plant science research. The panel affirmed that CPI had sustained achievements over many years and gained a national and international reputation for excellent basic research and the translation of that research. It did, however, indicate that some groups were very industry focused and appeared to have declined in basic science capability. It recommended that CPI continue to support capacity in the basic sciences underpinning its more applied research. The panel also observed that there was a strong cohort of excellent researchers in the Division and recommended it explore ways to maintain this into the future.

# Energy Group[31]

## Analysis of performance

### THE CHALLENGES

Australia's growth and way of life is underpinned by the export of our vast energy resources, plus domestic access to affordable and sustainable energy sources for electricity and transport.

Solutions are needed to shape Australia's energy future that will enhance the global competitiveness of our energy resources while ensuring the sustainability of the extraction, conversion and use of energy.

### OUR RESPONSE

Our Energy Group continues to work closely with industry, governments, the community and its research partners, to focus on productivity and environmentally-friendly technologies that maximise the economic, social and environmental wealth from Australia's rich endowment of energy resources and oceans.

With our partners Curtin University and The University of Western Australia, we are a founding member of the National Resource Sciences Precinct in Perth, officially launched in April 2014. The Precinct is a collaboration between industry, government and research institutions aimed at solving our nation's most critical resource challenges.

Our sustainable groundwater cooling system developed for the $80 million Pawsey Centre supercomputer is the first of its kind in Australia, and has the potential to revolutionise building and facility cooling. Available year-round regardless of weather conditions, it is expected to save over 14.5 million litres of water within two years.

**14.5M** LITRES OF WATER EXPECTED TO BE SAVED BY OUR GROUNDWATER COOLING SYSTEM WITHIN TWO YEARS.

The National Geosequestration Laboratory is on its way to delivering innovative solutions for safe, efficient carbon dioxide storage in Australia. Fundamental data was recently collected for a large-scale survey in south-west Western Australia using two vibroseis trucks. These specialised pieces of equipment are designed for minimal soil erosion and community and environmental impact. They are part of a larger package of state-of-the-art equipment vital to assessing the viability of commercial carbon storage in Australia.

**1ST** COMMERCIAL VEHICLE INSTALLATION OF OUR ULTRABATTERY THAT IS 70% CHEAPER TO MAKE.

### OUR PATHWAYS TO IMPACT

Our low-emission energy technology, the UltraBattery, achieved a significant milestone this year with its first commercial vehicle installation in Honda's Odyssey, which is now available for purchase in Australia. The UltraBattery is about 70 per cent cheaper to make than batteries with comparable performance and can be made using existing manufacturing facilities.

The UltraBattery gives the Honda Odyssey's engine the acceleration power needed – a challenge for conventional batteries in cars with idle start-stop.

The UltraBattery has turned the conventional 150-year old energy storage system into a dynamic and transferable technology. Its applications are varied and include hybrid vehicles, renewable energy storage, remote area power, emergency power backup and forklifts.

31 See organisational chart, pages 10–11, for the structure of each Research Group.

**AIM: TO DEVELOP AND APPLY LEADING-EDGE ENERGY RESEARCH THAT REDUCES GREENHOUSE GAS EMISSIONS, ENSURES ENERGY SUPPLY, MAXIMISES AUSTRALIA'S WEALTH FROM ITS ENERGY RESOURCES, AND DERIVES INCREASED, SUSTAINABLE BENEFITS FROM AUSTRALIA'S MARINE RESOURCES WHILE ENSURING CONSERVATION OF OUR MARINE BIODIVERSITY AND COASTAL HABITATS AND SETTLEMENTS.**

## Powering the future

The Australian electricity sector is at a crossroads with historically high retail electricity prices, widespread deployment of solar panels, the desire to reduce greenhouse gas emissions at the lowest cost possible, and declining aggregate peak demand and consumption. Australia's electricity landscape has huge potential for transformation and some of its greatest changes will be defined by consumer choices. Australians have unprecedented opportunity to tailor their electricity use and better meet individual needs.

There are several potential directions for Australia. Each has far-reaching implications for the electricity supply chain and would alter our country's electricity model. Recognising the significance of this time for the electricity sector, CSIRO convened the Future Grid Forum to develop and explore scenarios for Australia's energy future and support decision-making around what comes next.

The Forum brought together over 120 representatives of the electricity industry, government and community to inform the national conversation about Australia's electricity future and provide a way forward.

Forum partners recognised that the electricity system cannot be analysed and optimised by examining its separate parts. The result is Australia's first extensive whole-of-system evaluation of the energy chain, from generation to consumption.

Findings from the Forum were presented in a comprehensive report, *Change and choice: The Future Grid Forum's analysis of Australia's potential electricity pathways to 2050* (available from www.csiro.au). The report, developed through extensive quantitative modelling, analysis and social dimensions research, presents four scenarios of what Australia's future electricity system could look like.

Traditionally, electricity hasn't been a service consumers proactively engage in. The Forum's scenarios presented ways for people to take greater control of how they consume and produce electricity. Such a shift could potentially influence Australia's electricity sector's business model and encourage the emergence of services supplying individually tailored products.

**Australia's electricity landscape has huge potential for transformation and some of its greatest changes will be defined by consumer choices. Image: iStock**

# Environment Group[32]

## Analysis of performance

### THE CHALLENGES

Australians have stewardship of a beautiful, diverse, unique environment. Over 200 years of development of natural resources has provided a legacy of economic opportunity, but also environmental challenges.

The future of Australia and the world is being re-shaped by climate variability and change, natural resource quality and security, technological revolution, trade reform, poverty alleviation and national security concerns.

### OUR RESPONSE

Our Environment Group is boosting Australia's understanding of the operation and interaction of entire ecosystems, regional economies and societies. We are applying enhanced systems understanding alongside the development and deployment of new technologies, processes and services.

We have renewed our commitments with the Bureau of Meteorology to deliver improved weather and climate forecasts through the Australian Community Climate and Earth System Simulator. Together we are also delivering value-added water information products through the Water Information Research and Development Alliance.

We extended our commitment to the Integrated Marine Observing System – a national array of equipment monitoring the open oceans and coastal marine environment around Australia. We also joined the international *GlobalSoilMap.net* Consortium to have input into the development of an open access global soil information system.

We welcomed QGC as a member of the Gas Industry Social & Environmental Research Alliance, which funds research into the socio-economic and environmental impacts of the natural gas industry.

### OUR PATHWAYS TO IMPACT

We led an international team of scientists that confirmed a link between the Indian Ocean Dipole and extreme weather events. This information will enable farmers, industry, communities and governments to better prepare for droughts and increased bushfire risk, up to six months in advance.

The third *State of the Climate Report* was released, indicating temperatures in Australia are on average almost one degree warmer than a century ago, with most warming occurring since 1950.

We released a report examining strategies to protect Western Australia's Pilbara region's most threatened species, indicating the most cost-effective strategies are managing feral ungulates, creating predator-proof sanctuaries and managing feral cats. This information will help government and industry balance the environmental sustainability of the region with its increasing broad sector use.

32 See organisational chart, pages 10–11, for the structure of each Research Group.

## Using big data to manage biodiversity

For the first time, the majority of Australia's biodiversity data is now located in one place – and it is free for anyone to use.

Created using open source software, the *Atlas of Living Australia* contains over 50 million records of species and their locations gathered from 152 natural history collections and through citizen science.

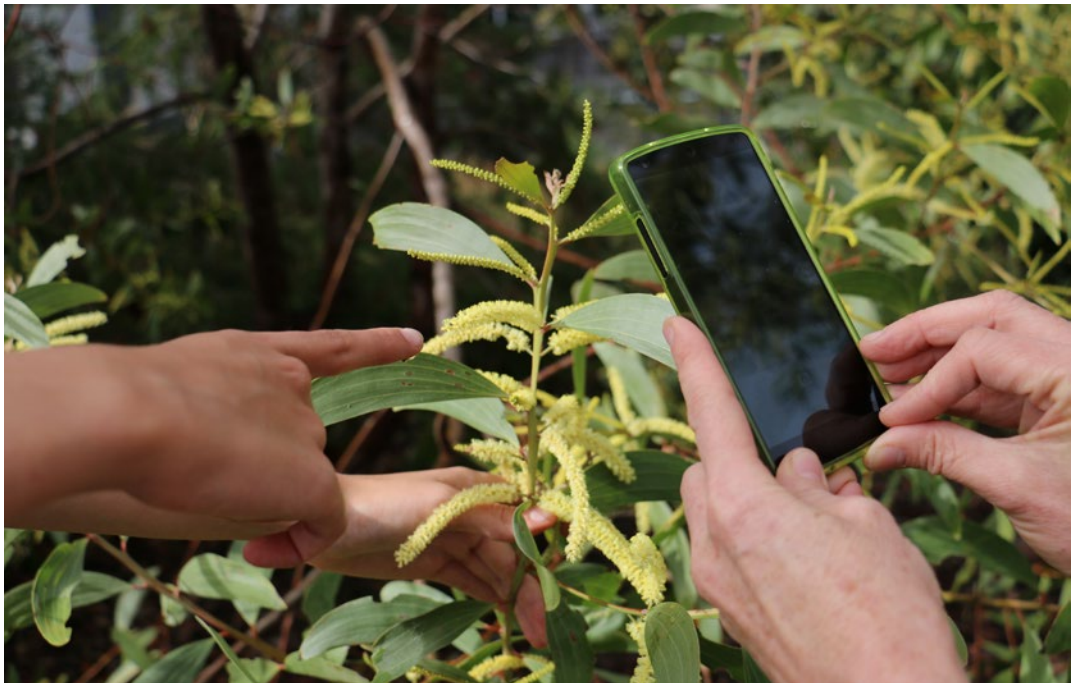
The Atlas is a collaboration between Australia's natural history collections and other custodians of biological data. It is integrating the country's biodiversity information, making it more accessible and useable online.

Australia's remarkable biodiversity is a key to our economic, social and environmental wellbeing. Until now, information on our country's biodiversity has been fragmented across biological collections, institutions and government agencies, making it difficult to access.

In the three years since the Atlas has been publicly available, the goal of making data available for reuse has been well and truly exceeded. On Australia Day 2014 the Atlas reached a major milestone, clocking up one billion downloads. Across the following seven months it reached another – two billion downloads.

Government and industry are now using the Atlas in the push to cut green tape. The wealth of information available in once place in real-time reduces the time taken to conduct environmental impact assessments, while improving their comprehensiveness and quality. This is streamlining and improving critical development approval processes.

The Atlas is also being used by researchers, teachers, students, local communities and natural resource managers to identify species or understand their distribution. This research is helping to sustainably manage our natural environment, land and water resources, food security and better manage invasive pests and weeds.



**Through citizen science and mobile technology, data about our diverse biodiversity is being added to the *Atlas of Living Australia*.**

# Food, Health and Life Science Industries Group[33]

## Analysis of performance

### THE CHALLENGES

Global food security remains a fundamental challenge as the world's population grows to an estimated nine billion by 2050. This population-driven food demand will need to be met through practices that are less carbon-intensive and with limited land and natural resource use.

Equally important is the requirement for food and nutritional quality and the role of this in human wellness and productivity, the prevention of chronic disease and subsequent costs on the Australian health system.

Additionally, increases in global trade and in the movement of plants, animals and people, along with climate change, are placing growing pressure on Australia's biosecurity, which is critical to protecting our people, environment and economy.

### OUR RESPONSE

In 2013–14, our Food, Health and Life Science Industries Group further developed its world-leading work improving the productivity and sustainability of Australian and international aquaculture industries. We renewed all our aquaculture selective breeding research partnerships which are improving productivity, reducing disease and increasing quality for both farmers and consumers. We also saw major advances in the commercialisation of our novel aquafeed additive Novacq™, with manufacturing licence agreements now established in Australia, China, Vietnam, Indonesia, the Philippines and Malaysia (more on page 45).

**68%** **YIELD INCREASE REVEALED THROUGH WATER USE EFFICIENCY PROJECT.**

The Group commenced a major relationship agreement with WA Resources Ltd for a large-scale, land-based prawn aquaculture project in northern Australia called Project Sea Dragon. CSIRO is now the leading R&D supplier for prawn domestication, selective breeding, health, nutrition, feed technology, environmental management and food quality on the project, which is designed to help meet the growing global demand for seafood.

The development of CYBERNOSE®, a benchtop prototype electronic biosensor, passed a key milestone this year, detecting an airborne chemical at one part per trillion within 15 seconds. We also succeeded in having the first CYBERNOSE® patent issued in the United States.

Our biosecurity capability was strengthened with the opening of a new biosecure PC3 immunology lab at the Australian Animal Health Laboratory in Victoria. With collaborators we also established the Geelong Centre for Emerging Infectious Diseases to focus on zoonotic diseases (those that pass from animals to people).

### OUR PATHWAYS TO IMPACT

This year the Group contributed to the first accurate map of Australia's soil carbon profile, working with partners to develop the map's prediction models. This map provided baseline data for monitoring the impact of land use on Australia's soil carbon stocks and has now attracted ongoing Australian Government funding.

A major project in collaboration with Flinders University and Clinical Genomics has led to a new blood-based diagnostic test for colorectal cancer. The test was launched to a consumer test market in June and is scheduled for national launch in late 2014 (more on page 51).

Our food and nutrition research program launched a new diabetes recipe book with Baker IDI as an extension of the Diabetes Diet and Lifestyle Plan. We also joined forces with Australian company Probiotec to develop a new multifaceted weight and health management program, which launched in pharmacies across Australia in May (more on page 50).

A national water use efficiency project, in collaboration with the Grains Research and Development Corporation, collected data from participants on impact and adoption to measure its success. Growers in northern NSW generated significant increases in water use efficiency and, by sowing slow-maturing wheats early, recorded increases in yield of 68 per cent.

33 See organisational chart, pages 10–11, for the structure of each Research Group.

**AIM: TO DELIVER SUSTAINABLE PRODUCTIVITY GROWTH AND VALUE TO FOOD AND FIBRE PRODUCTION IN SUPPORT OF THE ECONOMY, THE ENVIRONMENT AND THE HEALTH OF AUSTRALIANS. WE WILL DO THIS THROUGH SCIENTIFIC EXCELLENCE IN THE BIOLOGICAL AND FOOD SCIENCES AND THEIR APPLICATION TO CREATING PROFOUND IMPACT ACROSS THE AGRICULTURAL VALUE CHAIN, HEALTH, BIOSECURITY AND INDUSTRY.**

## New genetic test breeds the horns out of cattle

A new Australian Poll Gene Marker test is dramatically reducing the number of cattle bred with horns, improving animal welfare and saving the Australian cattle industry up to $30 million a year, the amount that bruising injuries from horns can cost.

The new test is 99 per cent accurate across a range of tropical and temperate cattle breeds, including breeds like the Brahman which thrive in northern Australia. The test allows identification of breeding animals that carry no genes for horns, enabling producers to breed the horns out of cattle.

The test is the result of a collaborative project between researchers at CSIRO, the University of Queensland and the Animal Genetics Breeding Unit at the University of New England. The team identified genetic markers that show which cattle are 'true polled', meaning the chance of horned offspring is significantly reduced.

Scott Hansen, then managing director of Meat & Livestock Australia, which funded the development of the test, said it will benefit producers by helping them reduce costs and improve animal welfare in their herds.

'This provides cattle producers with an additional tool to select the right genetics for their herds. In this case, a tool to help reduce costs of dehorning, to reduce production losses and mortalities associated with dehorning and to reduce downgrades of their product due to bruising and hide damage', Mr Hansen said.

The new Australian Poll Gene Marker was released to industry in November 2013 through the Animal Genetics Laboratory at the University of Queensland and Zoetis Animal Genetics.

**We are helping cattle producers breed the horns out of Brahman and other cattle in Australia.**

# Information Sciences Group[34]

## Analysis of performance

### THE CHALLENGES

The increasing digital connectivity of our world is seeing an explosion in the volume and speed of data available at our fingertips. It is predicted that by 2020, 37 billion 'things' will be available online and the average person will own six different smart devices. In this digital world, modern science also generates massive amounts of data. We need better ways to capture, manage and analyse this data to turn information overload into knowledge for industry, government and consumers.

### OUR RESPONSE

Our Information Sciences Group is delivering innovative technologies and services to support the needs of business and communities and is building our understanding of the universe and its origins.

In July 2013, we launched our Computational Informatics Division, bringing together our capabilities in key information sciences such as autonomous systems, signal processing and systems modelling, data science and decision and user science.

We continued to form close ties with industry, government and the community. We developed two new partnerships in China for our Terra Hertz imaging and digital modem technologies. We also continue to work with the United Nations on spatial information access.

Our biggest international alliance involves delivering world-leading technologies and research in astronomy, astrophysics and space tracking, via the Australian Square Kilometre Array Pathfinder (ASKAP) and international Square Kilometre Array projects.

Our leadership in astronomy was strengthened with further funding from NASA for our Canberra Deep Space Communication Complex (CDSCC). The CDSCC is part of NASA's Deep Space Network providing continuous radio contact with spacecraft exploring our solar system and beyond. The Network celebrated 50 years in 2014.

### OUR PATHWAYS TO IMPACT

In a world-first, we've fitted thousands of honey bees with tiny sensors to improve honey bee pollination and productivity on farms and better understand the decline in honey bee populations worldwide. The miniaturised sensing technology captures environmental data with unprecedented density and in locations not previously accessible (more on page 37).

Six of the 36 antennas that make up ASKAP have been fitted with CSIRO's first-generation phased array feeds technology. They successfully captured ASKAP's first image at twice the speed of comparable telescopes. The image covered an area 50 times that of the entire moon and verified the unprecedented quality of the new technology and ASKAP's unique third axis of rotation.

**1ST IMAGE HAS BEEN SUCCESSFULLY CAPTURED BY ASKAP AT TWICE THE SPEED OF COMPARABLE TELESCOPES.**

With Australian company Catapult Sports we've developed ClearSky, a tracking system for use in indoor sports venues. The system uses our patented WASP (Wireless Ad hoc System for Positioning) technology, which provides highly accurate tracking of objects in environments where traditional technologies fail. AFL teams have been trialling the system to improve athlete movements and develop game tactics.

With University of Tasmania we developed a smart cow collar that predicts cattle behaviour. It provides an inexpensive and practical method of optimising feeding and milk production. It has the potential to advise farmers on a cow's health to assist breeding and early injury intervention.

Also with University of Tasmania we developed biosensors that monitor the health of farmed oysters by measuring heart rate and other physiological indicators. Currently being trialled as part of Sense-T, these measures are helping farmers make better, real-time decisions on best farming practices to yield higher quality oysters.

34 See organisational chart, pages 10–11, for the structure of each Research Group.

**AIM: TO WORK WITH PARTNERS TO SOLVE NATIONAL CHALLENGES, DRIVE THE PRODUCTIVITY OF AUSTRALIAN INDUSTRIES AND DELIVER PUBLIC GOOD OUTCOMES THROUGH THE INNOVATIVE APPLICATION OF MATHEMATICAL, STATISTICAL, INFORMATION AND COMMUNICATION SCIENCES AND TECHNOLOGIES, AND TO BUILD AUSTRALIA'S ROLE IN DEVELOPING THE NEXT GENERATION OF SPACE SCIENCES.**

## Easy 3D mapping goes international

Access to high-quality 3D maps of an environment can help improve decisions and productivity across a wide range of applications. Generating these maps can be challenging as traditional methods either involve cumbersome measurements, expensive laser scanners or external references such as GPS.

To overcome these challenges, we partnered with UK company 3D Laser Mapping to commercialise our Zebedee technology – the world's first lightweight, handheld 3D laser mapping system. Simple to use, Zebedee creates detailed 3D maps quickly, reliably and cost-effectively.

Using Zebedee, we created the first interior 3D map of Italy's Leaning Tower of Pisa. Cramped stairs and complex architecture prevented bulky, tripod-mounted mapping technologies from capturing the Tower's interior, but using Zebedee our researchers simply walked through it.

Produced for Italian university, Scuola Superiore Sant'Anna and the international CyArk project, the map preserves the site digitally in intricate detail and would inform reconstruction if the Tower were to suffer catastrophic damage. The 3D computer model also allows users to remotely explore the Tower online or via immersive displays.

Zebedee has also produced intricate maps of heritage-listed ANZAC Square in Brisbane. The site includes the Shrine of Remembrance that houses an Eternal Flame in memory of the men and women that have represented Australia and New Zealand in overseas armed conflicts.

The Queensland Police Service purchased Zebedee to improve efficiency of crime scene examination and provide detailed records for court cases. Its compact size reduces crime scene interference, saves time and can record difficult areas, such as steep bushland.

UK mining company Cleveland Potash purchased Zebedee to map underground workings, complete stock surveys and comply with health and safety legislation at its Boulby Mine. The company has reported significant time savings, reduced equipment needs for routine work and more valuable data provided to mine managers.

Zebedee has already been used in many applications and we are exploring further possibilities and customers for the technology. Zebedee was awarded a Eureka Prize for Innovative use of Technology and the national and Queensland iAwards for Research and Development in 2013.

**We're digitally preserving heritage sites like the Leaning Tower of Pisa for the future using our Zebedee scanner. Credit: Interior data collected by CSIRO using Zebedee in August 2013. Exterior data provided by CyArk (data acquired in 2005 and 2006). Scanned with permission of the Opera della Primaziale Pisana. Assistance provided by Scuola Superiore Sant'Anna.**

# Manufacturing, Materials and Minerals Group[35]

## Analysis of performance

### THE CHALLENGES

Australia's manufacturing and minerals sectors operate in an increasingly challenging environment. Resource pressures are increasing, as are global competition and consumer demands for better and greener products and services. Innovative solutions that lead to ongoing sustainability in a global context are needed.

### OUR RESPONSE

Our Manufacturing, Materials and Minerals Group continues to provide expert advice to industry and the Government through various forums such as the Manufacturing Sector Advisory Council and the Committee for Economic Development Australia. It established Australia's first additive manufacturing network and hosted the inaugural automotive diversification workshop focused on helping suppliers transition to new markets.

Plans to build the Manufacturing Innovation Centre in Clayton, Victoria have been approved. The Centre will allow companies to access a range of emerging technologies to help inform their adoption and investment strategies and is also central to CSIRO's Precinct strategy.

In partnership with five Australian universities, the Group's Minerals Down Under and Future Manufacturing Flagships launched the Wealth from Waste Cluster to help identify viable options for recycling metals from Australian products.

In partnership with Monash University, the Victorian Environment Protection Authority, the Plastics and Chemicals Industries Association and the Victorian Department of State Development, Business and Innovation, we launched the Victorian Centre for Sustainable Chemical Manufacturing, enabling manufacturers to better interact with researchers to drive improved sustainable manufacturing outcomes. The Centre has successfully delivered milestones for 32 industry projects and six outreach activities so far.

The Group continues to strengthen its strategic partnerships with companies such as Boeing, General Electric, Orica and Dulux. The year 2014 marks the twenty-sixth year of our partnership with Boeing and the fifth with Orica.

**100TH** **'RESEARCHER IN BUSINESS' PROJECT CONDUCTED IN 2014.**

### OUR PATHWAYS TO IMPACT

We strengthened our leading position in advanced metals technologies and gained international recognition for our world-class 3D printing capability – multinational, BAE Systems, has chosen our LAB 22 as its preferred service provider.

The Group helped develop the Advisory System for Processing, Innovation & Resource Exchange program, to run economic models for recycling, sourcing raw materials and reviewing product 'end of life'. The models will reduce landfill, assist local government and increase operational margins for Australian small to medium businesses.

We were part of developing bushfire shelter standards and three community fire refuges in Victoria.

We helped Virtual Curtain commercialise a new cost-effective mining wastewater treatment that produces up to 90 per cent less sludge.

A new low-emission steelmaking process is being developed with Bluescope Steel and Arrium. It could increase productivity, halve carbon dioxide emissions and significantly reduce water and energy use for the global steel industry.

The Group worked closely with Enterprise Connect, the Australian Government organisation which helps connect businesses with research. In 2014, the Group facilitated its one hundredth 'Researcher in Business' project.

35 See organisational chart, pages 10–11, for the structure of each Research Group.

**AIM: TO HELP GROW AUSTRALIA'S WEALTH BY DEVELOPING IMPROVED COMMERCIAL PRODUCTS AND PROCESSES, FOSTERING INCREASED PRODUCTIVITY AND SUPPORTING BUSINESS AND JOB CREATION IN AN ENVIRONMENTALLY AND SOCIALLY RESPONSIBLE MANNER.**

## X-ray vision increases gold mining productivity

Australia produces around $10 billion worth of gold annually. However, a processing plant may only recover between 65 and 85 per cent of gold present in mined rock. Given a typical plant produces around $1 billion of gold each year, this means hundreds of millions of dollars worth of gold are going to waste.

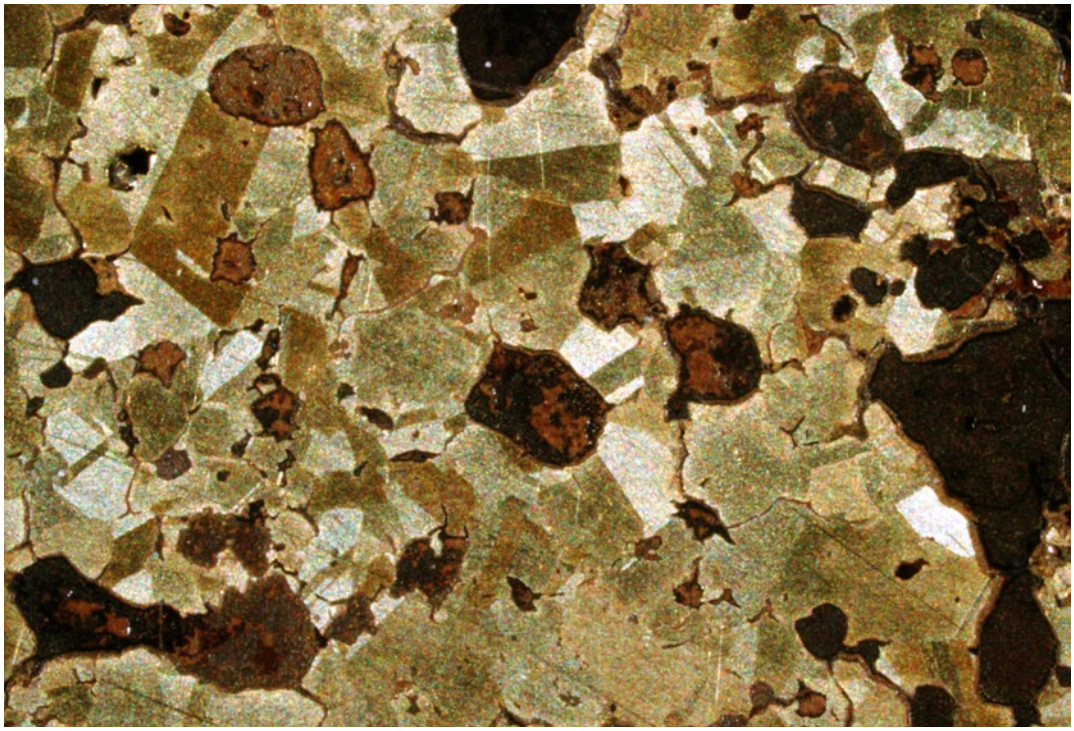
Working with Canadian x-ray accelerator company Mevex, CSIRO conducted a pilot study that shows gamma-activation analysis (GAA) is a much faster and more accurate way to detect gold than traditional chemical analysis methods.

GAA works by scanning mineral samples, typically weighing around half a kilogram, using high-energy x-rays similar to those used to treat cancer patients in hospitals. The x-rays activate any gold in the sample and the activation is then picked up using a sensitive detector. The method takes only a few minutes, is fully automatic and completely non-destructive. CSIRO tests show it can be two-to-three times more accurate than the standard industry technique of fire assay.

This means that mining companies can measure material coming in to and out of their processing plants much more rapidly and precisely. This allows them to monitor process performance in real-time, and potentially recover millions of dollars worth of gold that would otherwise be discarded. Another advantage of GAA is that it is more sustainable, as unlike fire assay it does not require the use of heavy metals such as lead.

While most of the work done so far has been based on the gold industry, the technique can be modified for other valuable commodities such as silver, lead, zinc, tin, copper and the platinum group metals.

Now that the effectiveness of the technique has been proven, CSIRO is looking to partner with local and international companies to establish a full-scale analysis facility to support Australia's mining industry.



**A new proven technique that detects gold more accurately in mined rock has the potential to save Australia's minerals industry millions of dollars worth of gold each year.**

# Program 3

## Science Outreach: Education and Scientific Publishing

At CSIRO, we are in a strong position to help create a knowledgeable society by raising scientific literacy and communicating the outcomes, impacts and benefits of our research, so the community can engage with major issues related to science. Communicating scientific research helps raise the profile of science, and CSIRO, within the community.

### OBJECTIVES AND DELIVERABLES

Our science outreach programs aim to promote the importance of CSIRO science and its application to students, parents, teachers and the Australian community. We support undergraduate, postgraduate and postdoctoral researchers to boost the calibre of researchers working in the Australian community and strengthen Australia's future innovation capacity. We also operate CSIRO Publishing, an independent science and technology publisher. It has a global reputation for quality products and services covering a wide range of scientific disciplines, including agriculture, chemistry, plant and animal sciences and environmental management.

### PROGRAM PERFORMANCE

This year, our Science Outreach Program continues to perform well. An assessment of the Program's six key performance indicators (KPIs) identified in the Portfolio Budget Statements, showed we have largely met expectations and targets. Table 2.6 provides an overview of the evidence for each KPI with a more detailed analysis following.

### Utilisation of science outreach programs

#### *Education programs*

We conduct various science education programs for school students, teachers and the public. These programs inform students, families and teachers of the valuable contribution scientific research makes to the community.

CSIRO Education has centres in each capital city and in Townsville. In 2013, they welcomed 366,305 participants (over 3000 more than in 2012), offering hands-on science for primary and secondary students. The centres also support the Scientists and Mathematicians in Schools (SMiS), CarbonKids and CREativity in Science and Technology (CREST) programs and Double Helix events.

SMiS links scientists and mathematicians with primary and secondary teachers and students. During 2013, SMiS managed over 1650 partnerships in 1177 schools (12 per cent of Australian schools). The program has been highly successful in engaging students in science and mathematics. It provides ongoing professional development and confidence for teachers and is a community base for scientists and mathematicians and their research.

CarbonKids is successfully established in over 300 schools, helping students understand the science behind climate change and reduce their own carbon footprint.

**Over 11,000 school students participated in our CREST program in 2013, planning and carrying out research projects. This was 3000 more than in 2012.**

**TABLE 2.6: PERFORMANCE INDICATORS FOR PROGRAM 3 – SCIENCE OUTREACH**

| KEY PERFORMANCE INDICATOR | TARGET (AND PERFORMANCE ASSESSMENT) | PERFORMANCE |
|---|---|---|
| Utilisation of science outreach programs | Increasing | Utilisation of science outreach programs has been maintained with the increases outweighing the decreases. Subscribers for Maths by Email increased by 18 per cent compared to last year, while membership to Double Helix Science Club and Science by Email programs decreased by five and one per cent respectively. The CREativity in Science and Technology (CREST) program worked with over 3000 more students than in 2012. Visitor numbers increased across most visitor centres, excluding the Parkes radio telescope, which recorded a decrease of 8.8 per cent on last year. |
| Awareness of science by CSIRO stakeholders | Positive perception and awareness | As in 2010 and 2011, community awareness of CSIRO remains high, but knowledge of CSIRO achievements low. The online tracking of community attitudes survey showed the younger the cohort sampled, the less their knowledge about CSIRO and the less their likelihood of being engaged on science issues. |
| Success of participants in the Science Outreach Programs | Qualitative evidence of success | The majority of our outreach activities saw increased participation or visitor numbers this year. Ninety-three per cent of visitors to our Parkes radio telescope visitors centre rated their experience 'good' or 'excellent'. Surveys from CDSCC indicate teachers remain positive about the programs offered, with repeat booking up until 2017, indicating a continued recognition of Science Outreach Programs. |
| International reach and impact of published journals | Improving trend in impact | Twenty-five journals were published, 14 of them in partnership with the Australian Academy of Science and 12 journals produced under agreements with Australian and international societies or institutions. *ECOS*, an online magazine, saw a significant increase, 40 per cent, in downloads compared to last year. Of the 25 journals, four are not ranked with Impact Factors. Nine journals improved their rating on the previous year. The average Impact Factor across all journals was 1.456. |
| New book titles | Increase or maintain number of titles | During 2013–14 CSIRO Publishing released 32 book titles in print and digital formats. This is down from 42 in 2012–13. |
| Net Profit from CSIRO Publishing | Positive net profit outcome from CSIRO Publishing | CSIRO Publishing delivered a net profit of $750,906 for 2013–14. |

**Blue shading**: indicates positive progress for the year and the target has been achieved.
**Green shading**: indicates some challenges have occurred during the year but they were managed.

In 2013, CREST helped over 11,000 school students plan and carry out research projects (over 3000 more than in 2012). Over 70 per cent received awards for their work. Many went on to participate in BHP Billiton Science and Engineering Awards, which recognise outstanding scientific research and technology projects by school students and the commitment and expertise of their teachers.

See Table 2.7 for Education program numbers.

*The Discovery Centre and major visitor centres*

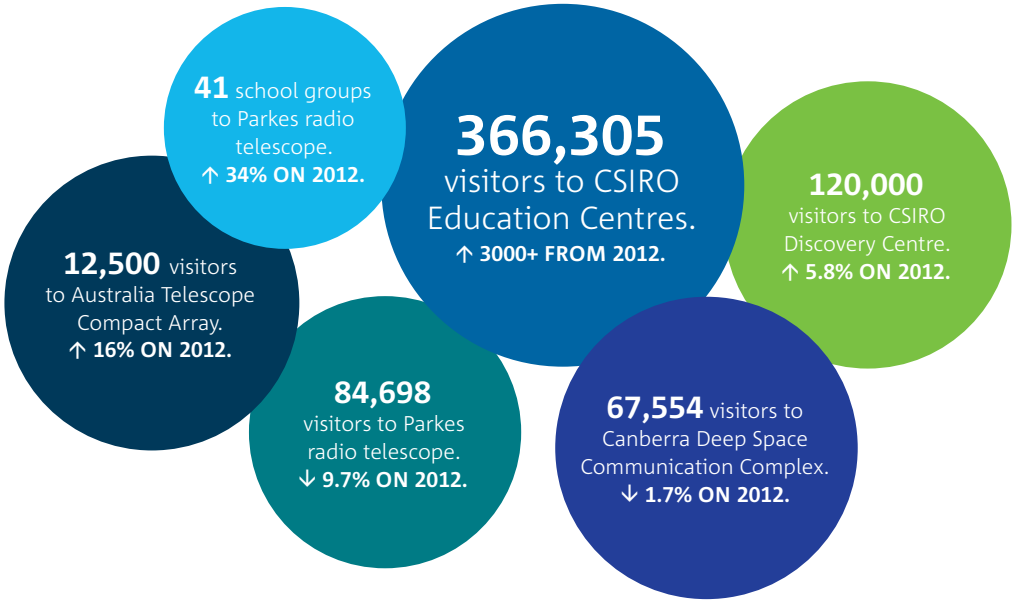
We host the CSIRO Discovery Centre in Canberra and major visitor centres at the Parkes and Narrabri observatories in NSW and the Canberra Deep Space Communication Complex (CDSCC). These centres are purpose-built to showcase our research in an entertaining way that demystifies and educates people of all ages about research and innovation.

CSIRO Discovery Centre continues to attract large crowds with its biggest audience being local and interstate school groups – 36,947 students during 2013–14. Discovery is a growing attraction, complementing Canberra's other science-themed institutions and receives over 120,000 visitors a year to its working laboratory, exhibitions and events – a six per cent increase on 2012.

For Canberra's 2013 Centenary year, our team at Discovery developed a walking tour of the region iPhone app, looking at CSIRO's contribution to the community over the 100 years, plus some significant locally-developed research achievements.

In 2013, Discovery also introduced the 'Ruby Payne-Scott Lecture' as part of our CSIRO Lectures series. The inaugural lecture honoured the legacy of one of Australia's greatest heroines of both science and women's rights. Two new exhibitions were opened highlighting our work in agricultural sustainability and our history in computing. A reassessment of capabilities saw weekend trading, children's birthday parties and commercial venue hire of Discovery's public spaces conclude at the end of 2013.

**The hands-on exhibits of our Discovery Centre cater for audiences of all ages.**



The Parkes radio telescope welcomed 84,698 visitors in 2013, an 8.8 per cent decrease on 2012. This was due to a significant drop in senior travellers. Visitor surveys noted higher fuel prices and reduced disposable income for self-funded retirees. Conversely, education and outreach programs were well up: 41 school groups compared with 27 the previous year, with approximately 1025 students and 100 teachers. Public outreach events included 25 school holiday workshops, 12 solar telescope viewing days, monthly amateur astronomy meetings and the annual Astronomy from the Ground Up! teachers' workshop weekend.

Public outreach activities at the Australia Telescope Compact Array at Narrabri included a self-guided visitor centre experience with approximately 12,500 visitors in 2013, up 2000 from 2012. Regular visitors to the observatory included seniors coach tours and local school groups (450 primary school students and teachers).

The CDSCC provided education programs to 10,023 students and teachers in 2013. Programs covered the broad spectrum of science, technology, engineering and mathematics subjects, with a focus towards their uses in space exploration and astronomy. Total visitor numbers were 67,554, down 1.7 percent on the previous year with surveys indicating the impact of higher fuel prices and lower disposable income for retirees the cause.

See Table 2.8 for visitor numbers.

### *Postgraduate and postdoctoral researchers*

Our postgraduate scholarship program provides opportunities in science and engineering for outstanding graduates who enrol at Australian tertiary institutions as full-time postgraduate students for research leading to the award of a PhD. PhD students at CSIRO are co-supervised by a university, allowing students to maintain and develop their university connections while being exposed to research in a working environment (see Table 2.9). The number of students fluctuates, with uneven intakes each year. A reduction in student numbers is often seen when a cohort moves through the program.

**TABLE 2.7: SCIENCE OUTREACH: EDUCATION PROGRAMS**

| PROGRAM | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| CSIRO Science Education Centres (visitors) | 386,500 | 389,287 | 374,797 | 363,099 | 366,305 |
| Double Helix Science Club (members) | 19,656 | 15,821 | 13,851 | 15,958 | 15,209 |
| Science by Email (subscribers) | 34,933 | 38,156 | 41,204 | 42,422 | 42,011 |
| Maths by Email[36] (subscribers) | - | 9,255 | 14,967 | 17,292 | 20,381 |
| Creativity in Science and Technology (CREST) (participants) | 8,801 | 9,668 | 8,385 | 7,767 | 11,048 |
| BHP Billiton Science Awards (participants) | 3,114 | 3,658 | 3,770 | 4,065 | 7,125 |

**TABLE 2.8: SCIENCE OUTREACH: VISITOR CENTRES**

| DISCOVERY CENTRE AND VISITOR CENTRE | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| CSIRO Discovery Centre (visitors) | 94,365 | 100,920 | 108,060 | 113,000 | 120,000 |
| Parkes radio telescope (visitors) | 112,342 | 95,104 | 96,609 | 92,876 | 84,698 |
| Canberra Deep Space Communication Complex (visitors) | 67,582 | 70,044 | 77,350 | 68,710 | 67,554 |
| Australia Telescope Compact Array, Narrabri (visitors) | - | - | - | 10,500 | 12,500 |

36 Launched in 2010

**TABLE 2.9: SCIENCE OUTREACH: CSIRO'S POSTGRADUATE STUDENTS AND POSTDOCTORAL FELLOWS AS AT 31 MAY 2014**

| | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| **Sponsored postgraduates**[37] | | | | | |
| PhD | 375 | 333 | 291 | 294 | 254 |
| Masters | 13 | 24 | 20 | 16 | 19 |
| Honours | 25 | 19 | 17 | 22 | 23 |
| **Total** | **413** | **376** | **328** | **332** | **296**[38] |
| **Supervised postgraduates**[37] | | | | | |
| PhD | 733 | 655 | 639 | 642 | 601 |
| Masters | 47 | 59 | 77 | 68 | 90 |
| Honours | 60 | 77 | 64 | 82 | 61 |
| **Total** | **840** | **791** | **780** | **792** | **752** |
| | | | | | |
| **Postdoctoral Fellows** | **330** | **333** | **326** | **324** | **325** |

## Awareness of science by CSIRO stakeholders

In 2013–14, we received further analysis from our third online tracking survey into community attitudes towards CSIRO. Conducted by Ogilvy Illumination, it confirmed that CSIRO is the first organisation to come to mind when Australians think about science and research in Australia. As in 2010 and 2011, community awareness of CSIRO remains high, but knowledge of CSIRO achievements low. The survey showed that the younger the cohort sampled, the less their knowledge about CSIRO and the less their likelihood of being engaged on science issues. This is a trend throughout developed countries. The study provided greater insight into people less interested in science (approximately 40 per cent of the population), showing what types of messages could increase their interest and what media best reaches them.

For more information on community awareness see page 23.

## Evidence of success in the science outreach programs

Science outreach and education are vital components of our community role. In 2013, we continued to deliver on this, with some changes to accommodate extraneous factors affecting the way we go about it.

A review of our education and outreach activities conducted in 2013 recommended that our programs should measurably and sustainably:

- contribute to expanding awareness and understanding of CSIRO amongst young Australians by providing authentic learning experiences
- encourage future employees towards careers in CSIRO
- increase awareness of the role of science, technology, engineering and mathematics and CSIRO's place in the National Innovation System.

37 A student may be either sponsored, supervised or both. The total number of individual students sponsored and/or supervised was 777, including more than 23 supervised in collaboration with Cooperative Research Centres and 60 through the Flagship Collaboration Fund. See Glossary on page 199 for definition of sponsorship and supervision.

38 Includes 48 students fully sponsored and 248 students partially sponsored by CSIRO.

The long-term effectiveness and impact of education and outreach programs, including Scientists and Mathematicians in Schools, CarbonKids and BHP Billiton Science and Engineering Awards, will be measured in coming years.

Our CSIRO Discovery Centre had over 120,000 visitors, with successful events. The Easter EGGstravaganza Inspiring Australia event saw 6000 visitors engage in fun, hands-on science across the Easter weekend.

Our Parkes radio telescope visitors centre conducts monthly exit surveys. In 2013, ninety-three percent of visitors rated their experience 'good' or 'excellent'. School programs this year focused on student learning outcomes and increasing understanding of the telescope's role in space exploration.

The Australia Telescope Compact Array has a steady flow of visitors, approximately 12,500 to its remote site in 2013. The visitor centre includes a space science exhibit highlighting radio astronomy science at the observatory. Highlights for 2013 included an Open Day marking its 25th anniversary, attracting approximately 800 people.

Education and outreach programs at the CDSCC attracted 10,023 school students and teachers during 2013, 19 per cent down on 2012. This was due to a reduction in education staff from two to one and the decision to reduce the intake of students for guided programs from 12,500 to 9000, to keep the remaining role manageable. Surveys of teachers indicate schools remain very positive about our programs, with repeat bookings up until 2017. The CDSCC was prominent during the 50th anniversary of NASA's Deep Space Network, with excellent national coverage in all media.

**Celebrating its 25th anniversary in 2013, the Australia Telescope Compact Array held an Open Day attracting around 800 people to its remote site.**

## CSIRO Publishing

### *International reach and impact of published journals*

CSIRO Publishing operates within CSIRO on a commercial basis on behalf of authors and customers in Australia and overseas.

During 2013–14, 25 journals were published by CSIRO Publishing. Fourteen were published in partnership with the Australian Academy of Science, a successful relationship since 1948. Twelve journals were produced under agreements with Australian and international societies or institutions. Additionally, special issues of journals were published in connection with societies and conferences in the United States, China, Japan, Italy, India, Germany and New Zealand. The journals are available free to developing countries through the United Nations program Research4Life. This program fosters scientific understanding and education in developing nations.

Online use of the journals resulted in 2,819,798 articles being downloaded. *ECOS*, the online magazine about science for sustainability, saw a significant increase, 40 per cent, in downloads (see Table 2.10).

**$9,802,464 TOTAL REVENUE AND $750,906 NET PROFIT DELIVERED BY CSIRO PUBLISHING.**

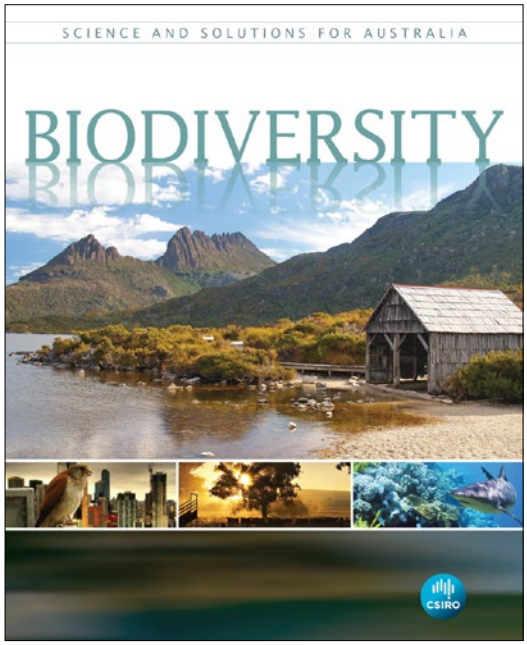
### *New book titles*

During 2013–14, CSIRO Publishing released 32 book titles, in print and digital formats. The digital books comprised approximately eight per cent of sales.

A highlight among the titles was *Biodiversity* from the Science and Solutions for Australia series. This work, authored by CSIRO scientists, provides a comprehensive assessment of biodiversity in Australia together with possible solutions to biodiversity-related issues.

### *Net profit*

A positive net profit of $750,906 was delivered for 2013–14. CSIRO Publishing's total revenue for the period was $9,802,464. The market continued to see greater sales of digital products at levels that match publishing industry trends.




**Published in 2014, *Biodiversity* is the latest title in our Science and Solutions for Australia series.**

**TABLE 2.10: CSIRO PUBLISHING**

| | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| CSIRO Publishing journal (downloads) | 2,092,283 | 2,633,703 | 2,653,848 | 2,641,160 | 2,819,798 |
| *ECOS* story (downloads) | 200,740 | 241,525 | 296,448 | 454,385 | 639,271 |

# Program 4

# National Research Infrastructure: National Facilities and Collections

CSIRO hosts National Research Infrastructure on behalf of the broader scientific community to assist in delivering research. There are two types of National Research Infrastructure: National Research Facilities and National Biological Collections.

## OBJECTIVES AND DELIVERABLES

### National Research Facilities

We operate a range of specialised laboratories, scientific and testing equipment and other research facilities. These are available for use by Australian and international researchers and not restricted to CSIRO staff. The three major National Research Facilities, classified as landmark facilities, are:

- The Australian Animal Health Laboratory (AAHL)
- The Australia Telescope National Facility (ATNF)
- The Marine National Facility (MNF).

AAHL is located in Geelong, Victoria and is a national centre of excellence in disease diagnosis, research and policy advice in animal health and human diseases of animal origin (zoonoses). AAHL helps protect Australia's billion dollar livestock and aquaculture industries and the general public from exotic and emerging infectious diseases.

ATNF comprises radio telescopes at three observatories near the towns of Parkes, Coonabarabran and Narrabri in NSW. The Facility offers a powerful view of the Southern Hemisphere radio spectrum and supports world-leading research by Australian and international astronomers. A fourth telescope, the next-generation Australian Square Kilometre Array Pathfinder (ASKAP), is currently being developed at the Murchison Radio-astronomy Observatory in Western Australia.

The MNF supports research across Australia's vast ocean territory and adjoining oceans. It supports Australian marine researchers and their international collaborators to carry out world-class research that addresses national challenges in fisheries management, geological resources, regional and global climate, coastal and offshore developments and marine operations.

### National Biological Collections

National Biological Collections are similarly available to all researchers and are storehouses of information on Australia's biodiversity. They support a significant part of the country's taxonomic, genetic, bio-geographical and ecological research and are a vital resource for conservation and research. CSIRO is the custodian of four National Biological Collections:

- Australian National Fish Collection (ANFC), specialising in marine fishes
- Australian National Herbarium (ANH), specialising in our native plants and weeds
- Australian National Insect Collection (ANIC), specialising in terrestrial invertebrates
- Australian National Wildlife Collection (ANWC), specialising in land vertebrates.

We also manage over 20 smaller collections of interest that contribute to the discovery, inventory, understanding and conservation of Australia's biological diversity.

## PROGRAM PERFORMANCE

This year, our National Research Infrastructure Program continued to perform well. An assessment of the Program's six key performance indicators (KPIs) identified in the Portfolio Budget Statements, showed we have largely met expectations and targets. Table 2.11 provides an overview of the evidence for each KPI with a more detailed analysis following.

**TABLE 2.11: PERFORMANCE INDICATORS FOR PROGRAM 4 – NATIONAL RESEARCH INFRASTRUCTURE**

| KEY PERFORMANCE INDICATOR | TARGET (AND PERFORMANCE ASSESSMENT) | PERFORMANCE |
|---|---|---|
| Utilisation of the National Research Infrastructure | Maintain or Increase | We maintained the availability levels and supported an increase in the use of the National Research Infrastructure under its custodianship. More than 76 per cent of major facility ATNF time was allocated to astronomical observations in 2013–14, recording an increasing trend since 2010–11. |
| Maintenance and operation of National Research Infrastructure | Meet International Standards | Compliance with relevant Australian and International Standards was achieved. The new Biosecure Immunology Laboratory will provide more specialised world-class facilities for researchers to harness a host's successful immune mechanisms to develop new treatments for highly infectious viruses. |
| Coverage of National Biological Collections | Maintain or Increase | The National Biological Collections provide approximately 70 per cent coverage of Australian species (and up to 99 percent in some areas). Coverage levels were maintained across all collections with the Australian National Fish collection increasing by one per cent from 2012–13. |
| Proportion of National Biological Collections digitised and available to the public | Maintain or Increase | The proportion of the National Biological Collections digitised was maintained. The Australian National Herbarium increased collection digitisation by four per cent from 2012–13. |
| Response to national events | Timely Response | In 2013, AAHL was actively involved in the Avian Influenza outbreak in NSW, confirming the two cases and characterised the virus as being the H7N2 subtype, similar to those recently identified in some wild bird populations. |
| Scientific contributions in support of research | Demonstrated high-quality contributions | Our National Research Infrastructure Program continues to provide significant support and opportunities for collaboration with Australian and international scientific communities. For example, in late-2013 an international team including CSIRO reported in *Nature* the isolation of a very close relative of the Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) from horseshoe bats in China, confirming them as the origin of the virus responsible for the 2002–03 pandemic. The discovery was made possible by using the world renowned bat virus isolation methodology developed at AAHL by CSIRO's Bat Virology Group. Similarly a team of scientists from the University of California Berkley and CSIRO reported in 2014 in *Nature Communications* significant insights into the evolution of Australian biodiversity using data from the Australian National Herbarium. |

**Blue shading**: indicates positive progress for the year and the target has been achieved.

## Utilisation of the National Research Infrastructure

### *Australian Animal Health Laboratory*

As a crucial part of Australia's biosecurity infrastructure, maintaining the integrity of AAHL's high-containment facility and ensuring our preparedness in the event of an outbreak, requires continuous monitoring. AAHL has therefore remained operational 24 hours a day, 365 days a year since the official opening in 1985, and every year welcomes over 2000 visitors, many of them visiting scientists. The combination of our scientific capability and the benefits of the AAHL Facility place us in a strong position, nationally and internationally, to harness this potential in the form of new research partnerships and funding. We are also experiencing increased interest since many of our Facility's laboratories became available as a national resource, thanks to operational funding support from the National Collaborative Research Infrastructure Strategy (NCRIS). In 2013–14, as part of the NCRIS agreement, we started offering specialised biosecurity and biosafety training to international organisations and we expect this area to grow significantly in the coming years.

**2000 VISITORS ACCESS OUR AUSTRALIAN ANIMAL HEALTH LABORATORY EACH YEAR, MANY OF THEM VISITING SCIENTISTS.**

### *Australia Telescope National Facility*

The ATNF's telescopes continue to be oversubscribed (see Table 2.12). Observing time is determined on the scientific merit of the observing proposals submitted for assessment. As in previous years, international astronomers received half the total observing time, with CSIRO and other Australian researchers sharing the remainder. Over 75 per cent of the time was allocated for astronomical observations on the Australia Telescope Compact Array and Parkes telescope, with telescope maintenance, reconfigurations and changes accounting for about 20 per cent. Time lost during scheduled observations due to equipment failure remained below five per cent, comparable with other observatories. Over 120 papers using ATNF data were published in refereed journals in 2013, including six in *Science* and *Nature*.

**120+ PAPERS USING ATNF DATA WERE PUBLISHED IN REFEREED JOURNALS IN 2013, INCLUDING SIX IN THE PRESTIGIOUS JOURNALS *SCIENCE* AND *NATURE*.**

Observing time at the Mopra telescope near Coonabarabran is primarily dedicated to researchers from the National Astronomical Observatory of Japan, the University of NSW and the University of Adelaide, as the telescope now operates under a new model funded by these groups. However, some observing time is made available to the general astronomical community as National Facility time.

### *Marine National Facility*

With the MNF in transition to the new vessel *Investigator*, the Facility provided 109 days of ship time before the decommissioning of the *Southern Surveyor* in late 2013. Participants included 24 scientists from 11 Australian research institutions, including the Antarctic Climate and Ecosystems Cooperative Research Centre, Bureau of Meteorology, James Cook University, Australian National University, University of NSW, University of Tasmania, University of Technology Sydney, University of Western Australia, Australian Institute of Marine Science, University of Sydney and CSIRO. One international collaborating scientist from the United States also took part in a voyage during this period.

Supporting the development of the next generation of marine researchers, the MNF enabled eight students to experience scientific work at sea as part of the *Next Wave* program. This program provides a unique opportunity for students and early-career researchers to experience the working environment on a blue-water research vessel and will continue to expand with the commissioning of *Investigator*.

**TABLE 2.12: UTILISATION OF NATIONAL RESEARCH FACILITIES[39]**

| ACCESS TO NATIONAL RESEARCH INFRASTRUCTURE | 2009–10 | 2010–11 | 2011–12 | 2012–13 | 2013–14 |
|---|---|---|---|---|---|
| **Australia Telescope National Facility[40]** | | | | | |
| Time allocated to observations (%) | 75.3 | 72.4 | 73.6 | 76.7 | 76.8 |
| Time lost to equipment failure (%) | 2.9 | 3.1 | 2.7 | 2.7 | 3.3 |
| Time allocated to CSIRO staff (%) | 24 | 24 | 22 | 22 | 19 |
| Time allocated to other Australian researchers (%) | 23 | 25 | 21 | 28 | 30.3 |
| Time allocated to international researchers (%) | 53 | 51 | 57 | 50 | 50.7 |

## Maintenance and operation of National Research Infrastructure

### *Australian Animal Health Laboratory*

In May 2014, we officially opened a new Biosecure Immunology Laboratory. Located inside AAHL's biologically secure area, this new laboratory enables researchers to compare the immune responses of different animal species, including humans, with the most pathogenic infectious agents. Our researchers at AAHL are already world-renowned for their work with zoonotic agents – those that can pass from animals to people – but this new laboratory will provide more specialised techniques, at a cellular level, to help pinpoint the immune mechanisms by which animals fight infections. Understanding how pathogens affect different hosts, for example, how pigs or poultry protect themselves from influenza, will allow our immunologists to harness a host's successful immune mechanisms to develop new treatments for highly infectious viruses such as influenza and Middle Eastern Respiratory Syndrome.

This year, we also initiated a working group to evaluate the extent of works required for an AAHL modernisation project. As the Facility has now been in operation for 30 years, 'mid-life' upgrades are essential to ensure the Facility is best equipped to meet future research and regulatory requirements.

To ensure best practice in aspects of biocontainment and to uphold the quality and integrity of our research, AAHL continues with its aim to maintain or exceed the many regulatory requirements as certified by the Department of Agriculture, the Office of the Gene Technology Regulator and the Department of Health's Security Sensitive Biological Agent legislation, while also ensuring all relevant ISO accreditation.

### *Australia Telescope National Facility*

Our Australia Telescope Compact Array marked its 25th year of operation in September 2013. The telescope has had several upgrades, gaining the ability to observe at a greater range of frequencies, particularly higher frequencies and greater sensitivity to faint signals. The latest upgrade, completed this year, has made the telescope four times more sensitive. It also greatly increased the bandwidth at higher frequencies (4–12 GHz), allowing astronomers to detect previously unreachable spectral lines and gain considerably more information about the movement of gas within galaxies and of whole galaxies themselves.

During the year, systems were put in place to allow astronomers to control the Parkes radio telescope from a remote location, eliminating the need for an operator to be present in the telescope tower. The default location for using the telescope is now the new Science Operations Centre at ATNF headquarters in Sydney. Once qualified in its use, astronomers can operate the telescope from their home institutions.

39 Figures are determined for ATNF observing semesters so that, for example, the 2013–14 figures apply to the period 1 April 2013 to 31 March 2014.

40 More information can be found in the ATNF's Annual Report: see www.atnf.csiro.au/the_atnf/annual_reports/index.html.

All 36 ASKAP antennas are in place at the Murchison Radio-astronomy Observatory and six have been outfitted with widefield phased array feeds – in essence, 'radio cameras' for imaging the sky. This year we took major steps towards bringing the telescope into operation: these included the detection of the 21-centimetre spectral line of hydrogen from known astronomical sources and the creation of a test image covering ten square degrees of sky – a region 50 times larger than the full Moon. These achievements show the new hardware, firmware and software systems are all working well and that the novel aspects of ASKAP's design will let it outperform a conventional telescope.

### *Marine National Facility*

The MNF operates under the direction of an independent Steering Committee. To date, the MNF's capability has been delivered by the 66-metre *Southern Surveyor* and a suite of unique scientific equipment providing over 28 years of marine data. CSIRO is commissioning a new state-of-the-art MNF research vessel *Investigator* to replace *Southern Surveyor*. *Investigator* is nearing completion and due to arrive in Hobart during September 2014. *Investigator* will carry out voyages from the tropics to the Antarctic ice edge, carry up to 40 scientists and have the capability to spend up to 300 days per year at sea on voyages up to 60 days in duration.

***INVESTIGATOR* WILL CARRY OUT VOYAGES FROM THE TROPICS TO THE ANTARCTIC ICE EDGE, CARRY UP TO 40 SCIENTISTS, AND BE CAPABLE OF SPENDING UP TO 60 DAYS AT A TIME AT SEA.**

*Investigator* hosts an extensive suite of state of the art scientific research equipment and is one of a handful of research vessels in the world designed for very quiet operation, with the ability to undertake acoustic mapping and sampling to the deepest parts of our oceans. With greatly increased atmospheric research capabilities, *Investigator's* weather radar can study detailed cloud formation processes in a 150-kilometre radius up to 20-kilometres above the ship. Interest in the new vessel remains high with progress being reported to the public through a CSIRO blog – http://csirofrvblog.com. In May 2014 the Australian Government reaffirmed a commitment to the MNF, allocating $65.7 million over the next four years to operate *Investigator* for 180 days per year.

41 See: www.ala.org.au
42 See: www.avh.chah.org.au
43 See: www.ozcam.org.au

## Coverage of National Biological Collections

The National Biological Collections provide approximately 70 per cent coverage of Australian species (and up to 99 per cent, see Figure 2.11), although in the national context the collections have focused on building strength in particular areas.

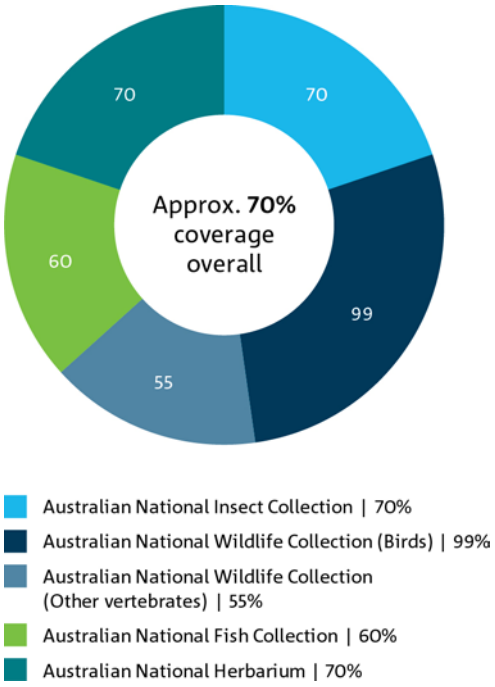
**~70% OF AUSTRALIAN SPECIES ARE COVERED BY THE NATIONAL BIOLOGICAL COLLECTIONS.**

These collections are a vital resource for the provision of accurate and reliable information on species identification for biosecurity, conservation and the development of sustainable land and marine management systems. The collections contribute to a range of national and international initiatives such as the Global Biodiversity Information Facility and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Sciences through staff participation and data provision. They also contribute significantly to on-ground national biodiversity research initiatives such as Bush Blitz (Australian Biological Resources Study), the Biomes of Australian Soil Environments project (Bioplatforms Australia) and the High Rainfall Zone Biodiversity Project (Grains Research and Development Corporation). In each case the collections make a crucial contribution, providing unique biodiversity reference datasets that represent the highest quality, comprehensive, up-to-date, geocoded, biologically accurate, digitised inventories of Australian biodiversity assets.

The collections continue to be widely accessed by a range of users. Continued access to collections' data via web portals – such as the *Atlas of Living Australia* (ALA)[41], *Australia's Virtual Herbarium*[42] and the *Online Zoological Collections of Australian Museums*[43] – and the increasing amount of data available as the National Collections are digitised, has seen sustained demand for access to specimens by external researchers (see Table 2.13).

Interactions between the individual collections have continued. A project evaluating collection management software, with a view to improving and integrating data management across the collections, as well as providing more secure long-term data management, has progressed significantly and is nearing completion.

**FIGURE 2.11: COVERAGE OF THE NATIONAL BIOLOGICAL COLLECTIONS**




## Proportion of National Biological Collections digitised

The proportion of specimen level material digitised in the four collections ranges from five to 100 per cent, see Figure 2.12.

Digitisation activity in the ANIC is focused on databasing and imaging the most scientifically valuable specimens and is value-adding to research projects by making taxonomic and phylogenetic information available online. Imaging of whole insect drawers has continued. Images and data are delivered to and accessible through the *Atlas of Living Australia* (ALA).

The holdings of the Australian National Wildlife Collection (ANWC) are almost completely digitised. Four thousand files of bird vocalisations from the Sound Library are available for download from the ALA.

The Australian National Fish Collection (ANFC) specimen data is 100 per cent digitised. Approximately 65 per cent of these data are available publicly through the *Online Zoological Collections of Australian Museums* and the ALA.

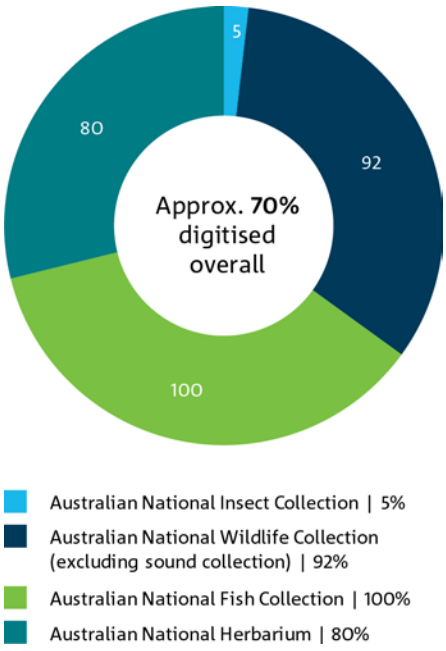
**TABLE 2.13: COMBINED UTILISATION OF NATIONAL BIOLOGICAL COLLECTIONS**

| USE OF NATIONAL BIOLOGICAL COLLECTIONS | 2009–10 | 2010–11 | 2011–12 | 2012–13 | 2013–14 |
|---|---|---|---|---|---|
| Number of specimens dispatched | 29,300 | 25,925 | 15,548 | 13,660 | 30,514 |
| Outward going loans | 147 | 193 | 157 | 153 | 222 |
| Tissue samples sent | 3,800 | 4,447 | 3,819 | 2,415 | 8,461 |
| Tissue sample grants | 44 | 40 | 43 | 74 | 34 |
| Number of visitors hosted | 186 | 336 | 267 | 238 | 233 |
| **Total visitor research days** | **713** | **551** | **800** | **1,066** | **799** |
| Number of tours hosted | 57 | 70 | 52 | 67 | 79 |
| **Total number of visitors on tours** | **597** | **1,266** | **363** | **586** | **584** |

The majority of ANH Australian specimen records are digitised, available through *Australia's Virtual Herbarium* and the ALA. A pilot project examining the feasibility of digitising ANH specimens from Papua New Guinea has also been undertaken, with promising results. Imaging of type collections continues as part of a joint initiative across Australian herbaria funded by the Mellon Foundation.

New digitisation technologies are expanding the ways in which data from the collections can be utilised. The Australian National Insect Collection (ANIC) was involved in a collaborative project with CSIRO Computational Informatics and the ALA, to create true-colour 3D models of insects. These 3D models represent high-quality visualisations of physical specimens and are a novel solution to quickly extract, analyse and share the rich information in our biological collections. The technology used in creating these scans won the 2014 ACT iAward in the Research and Development category and will be heading to the National iAwards Competition in Melbourne in August 2014.

**FIGURE 2.12: DIGITISATION OF THE NATIONAL BIOLOGICAL COLLECTIONS**




## Demonstrated response to national events

### *Australian Animal Health Laboratory*

In October 2013, AAHL's Diagnostic, Surveillance and Response scientists were actively involved in the Avian Influenza outbreak in NSW. As the National Reference Laboratory for Avian Influenza, AAHL was instrumental in confirming the two cases on chicken farms near Young and characterised the virus as being the H7N2 subtype, similar to those recently identified in some wild bird populations. NSW Department of Primary Industries worked successfully to contain the outbreak minimising the potential impact.

For the past year, the United States has been fighting an outbreak of the viral disease, Porcine Epidemic Diarrhoea (PED). Unlike foot-and-mouth disease, it is not a trade-restricting disease, but rather a production-related disease and particularly fatal in piglets. As part of AAHL's work in disease preparedness and in response to the potential threat posed by PED to the Australian pork industry, our diagnostic scientists developed the capability to test for PED, thus ensuring a rapid response should the disease reach our shores. This is all part of our ongoing national responsibility to protect Australia's livestock industry from disease.

## Scientific contributions in support of research

Every year excellent science is being conducted with the support of our National Research Infrastructure. Here are just some highlights of the high-quality scientific contributions made by the National Facilities and Collections in 2013–14.

### *Australian Animal Health Laboratory*

As reported in *Nature*, an international research team including CSIRO, isolated a close relative of the Severe Acute Respiratory Syndrome coronavirus (SARS–CoV) from horseshoe bats in China, confirming the bat as the origin of the virus responsible for the 2002–03 pandemic. The discovery was made possible by using the world-renowned bat virus isolation methodology developed at AAHL by CSIRO's Bat Virology Group. The SARS virus killed 774 people of the 8094 people infected. It is hoped the results will help governments design more effective prevention strategies for SARS and similar epidemics.

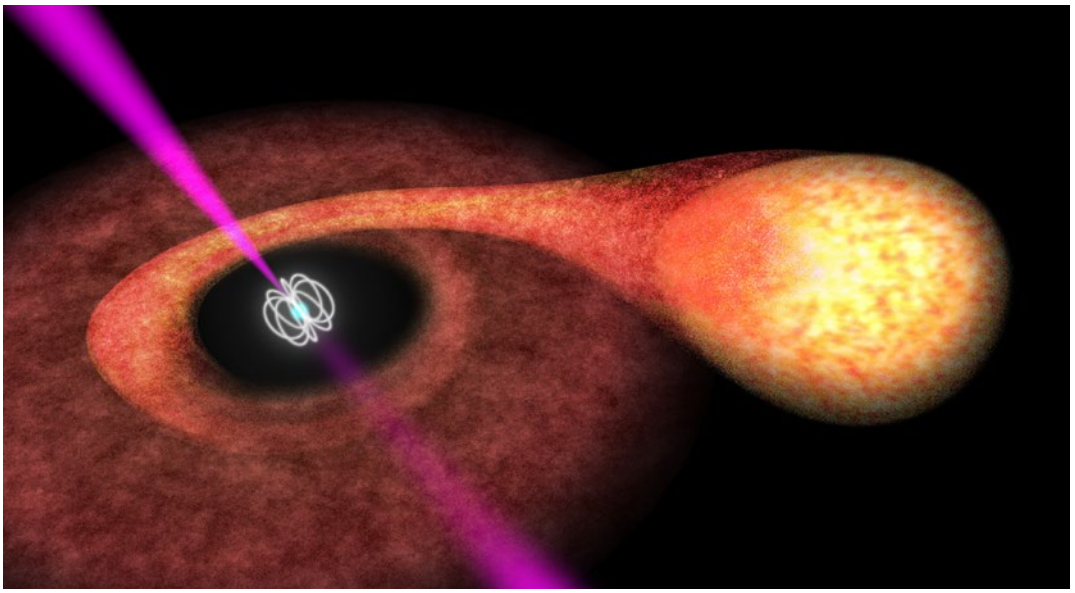
This year, our Biosecurity Flagship's Hendra virus research team worked at the highest containment levels at AAHL to demonstrate 12-month duration of immunity of the Equivac® vaccine. This research could not have been performed anywhere else in the world. See page 114 for more information on this achievement.

### *Australia Telescope National Facility*

An international team of astronomers used telescopes including our Parkes telescope and Australia Telescope Compact Array to identify a small star that switches between emitting x-rays and emitting radio waves. The star is a pulsar, the leftover core of a 'regular' star that has exploded. Its unusual behaviour appears to be caused by matter falling onto it from a companion star. Published in the journal *Nature*, this is the first direct evidence of one kind of pulsar turning into another and helps us better understand how pulsars change over time.

Dr Kimberley Clayfield, Executive Manager for Space Sciences and Technology in CSIRO, become the first Australian to receive the Lawrence Sperry Award from the American Institute of Aeronautics and Astronautics. CSIRO Fellow and first Director of ATNF, Professor Ron Ekers, received the 2014 Grote Reber Medal for his lifetime of achievements in radio astronomy.

**Researchers have confirmed the bat as the origin of the Severe Acute Respiratory Syndrome coronavirus responsible for the 2002–03 pandemic. Image: iStock**



**An artist's impression of the pulsar and its companion star. Credit: ESA**

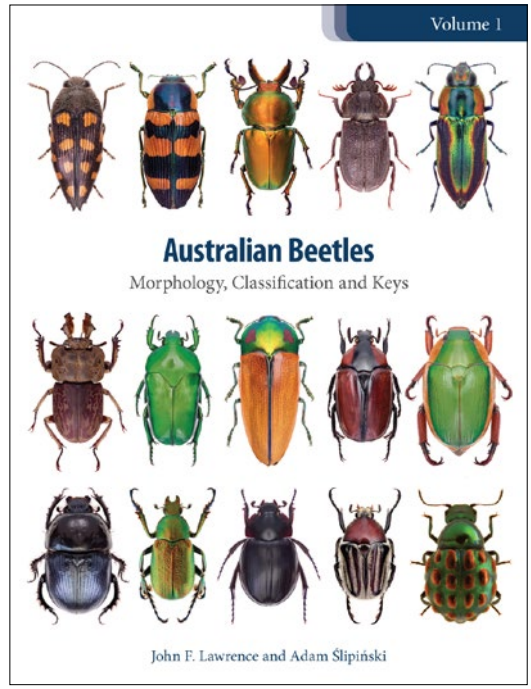
### *Marine National Facility*

Prior to decommissioning, four *Southern Surveyor* voyages retrieved moorings that are providing valuable data for improving regional and global climate models and our understanding of the marine environment. Moorings from the Southern Ocean are providing insights into the major role of this ocean as a carbon sink, while moorings from the east Australian Current are being used to measure changes in this major current system and future impacts on Australia's eastern marine environment. Also, researchers on a transit voyage from Broome to Brisbane surveyed the microbial oceanography of northern Australia, obtained detailed maps of the Great Barrier Reef shelf edge to determine the submerged geographic limits of the world's longest fossil (currently at 1000-kilometres) and measured greenhouse gases in the marine atmosphere which highlighted the influence of terrestrial burning.

***Southern Surveyor*** **has served Australian and international scientists throughout its operation as Australia's National Marine Facility.**

### *Australian National Insect Collection*

During 2013–14, ANIC researchers working with scientists from other organisations – such as the Beijing Genomics Institute, British Natural History Museum and the Chinese Academy of Sciences – collaborated on a large project aimed at analysing the evolution of all insects worldwide, using very large molecular genetic datasets derived from next generation sequencing. ANIC scientists also published two major works on beetles, the largest group of insects in Australia and the world: *Australian Beetles*, a major work covering all beetle families in Australia, and the first of two volumes on the economically and environmentally important *Australian Longhorn Beetles*.




***Australian Beetles*** **covers all beetle families in Australian and is published by CSIRO Publishing.**

### *Australian National Wildlife Collection*

This year saw significant developments in studies by the ANWC on the relationship of the faunas of Australia and our near neighbour Papua New Guinea (PNG). Extensive field work, particularly in southern PNG, is building new collections suitable for modern molecular studies, while laboratory work has helped unravel the evolutionary connections between wetland and savanna birds of southern PNG and northern Australia. Specimens from this project are also being used in several other international collaborative projects.

For example, the Helmeted Friarbird (pictured) is one of the key species of interest driving current ANWC field work in PNG. Inclusion of the PNG populations of this species in genetic analyses will contribute to a more complete understanding of genetic and evolutionary connectivity between Australia and PNG.

### *Australian National Fish Collection*

The ANFC continued to deliver high quality taxonomic research on Australia's fish fauna through a number of projects undertaken within our Wealth from Oceans Flagship. We continued our engagement with external clients, such as the Australian Centre for International Agricultural Research (ACIAR) and Bay of Bengal Large Marine Ecosystem project, undertaking taxonomic research and/or training in Indonesia, Papua New Guinea, Maldives, Myanmar and Thailand. The recently completed ACIAR-funded Indonesian fisheries project culminated in a book published in late 2013, *Market Fishes of Indonesia*. The ANFC has also commenced a collaborative project with Bioplatforms Australia. This project will use tissue samples from the ANFC to develop a reference data set for use in DNA-based identification of Australian fishes of commercial and biodiversity significance.

**The Helmeted Friarbird is a key species of interest for ANIC in Papua New Guinea[44].**

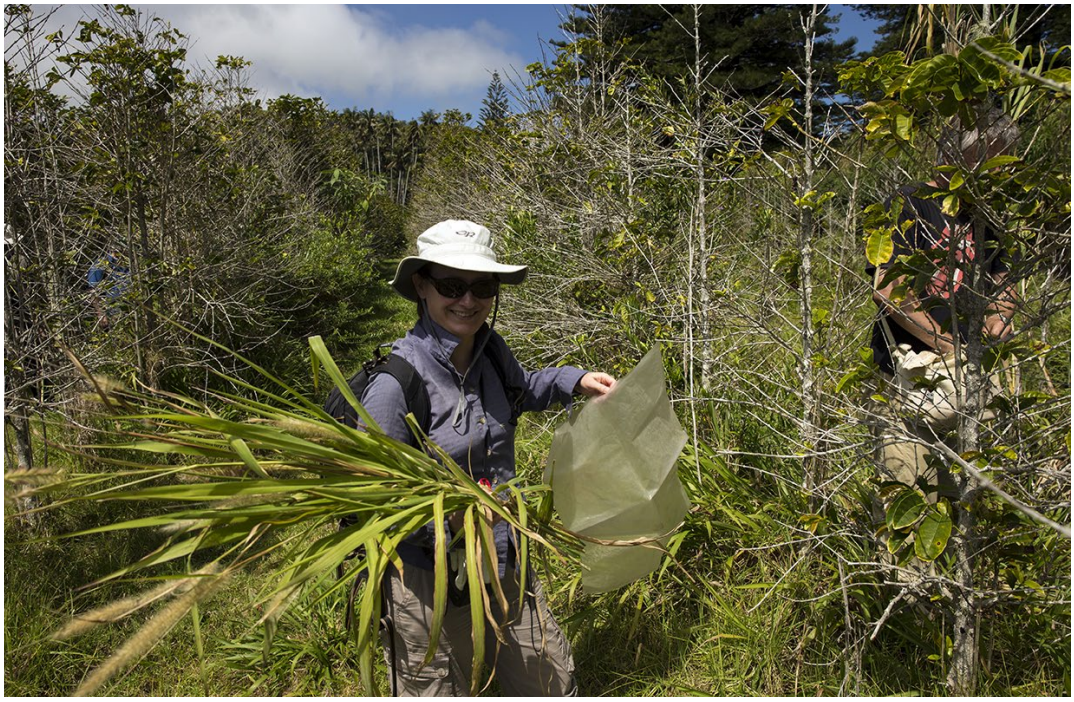
**Participants in just one of the successful training workshops held in Papua New Guinea as part of an ongoing four-year ACIAR project led by CSIRO.**

44 Image: http://biocache.ala.org.au/occurrences/c6e1146b-2a1b-4e0d-ba26-a208e7d39b5f

### *Australian National Herbarium*

As part of the Norfolk Island Quarantine Survey, managed by the Federal Department of Agriculture, the ANH undertook surveys of the weed flora of Norfolk Island. The surveys documented biosecurity risks for the island, covering plants and insects as well as plant and animal diseases. Over the course of the surveys more than 400 specimens of weeds and other introduced plants were collected by the ANH, greatly increasing knowledge of the flora of Norfolk Island and identifying potential biosecurity risks.

Working with partners across universities, state and federal research sectors and Bioplatforms Australia, ANH staff are leading the Biomes of Australian Soil Environments project. Over the last 24 months this project has taken over 500 soil samples across Australia, and used next-generation DNA sequencing to characterise the microbial community and model it against soil, vegetation and climate parameters. This data represents a baseline against which to measure effects of human activity on microbial community structure and soil biological function, and how such changes influence ecosystem productivity and resilience.



**Bronwyn Collins and Brendan Lepschi (obscured) (ANH), collecting specimens of elephant grass on Norfolk Island as part of the Norfolk Island Quarantine Survey. Credit: Oliver Strewe**

# Program 5
## Science and Industry Endowment Fund

The Science and Industry Endowment Fund (SIEF) is a separately constituted trust under the *Science and Industry Endowment Act 1926*.

The Fund invests in science that addresses issues of national priority and contributes to Australia's sustainable future, including:

- fundamental research for sustainable resource use, environmental protection and community health
- tactical research seeking solutions to national challenges
- collaborative research between organisations working on solutions to national challenges
- scholarships sustaining young researchers capable of working on national challenges.

### OBJECTIVES AND DELIVERABLES

Recognising that science will remain a key driver of Australia's economic, industrial, environmental and cultural development, the Fund invests in research that will contribute to Australia's sustainable growth.

CSIRO Chief Executive Dr Megan Clark is Trustee and awards funding to parties across the National Innovation System. The SIEF Advisory Council provides independent advice and recommendations on funding of proposals from across the National Innovation System. CSIRO manages the Fund on behalf of the Trustee.

Some programs operate on a competitive basis, others by invitation on the basis of identified needs.

SIEF funds the:

- Research Project Program (competitive)
- Research Infrastructure Program
- Special Research Program
- Promotion of Science Program
  - Joint Chair appointment (CSIRO/ Macquarie University)
  - Fellowships and Scholarships (competitive).

### PROGRAM PERFORMANCE

The contribution of research can only be measured long-term, but key performance indicators are chosen for early program stages, with additional indicators as programs mature.

**100%** OF RESEARCH PROJECTS ADDRESS NATIONAL CHALLENGES

**TABLE 2.14: PERFORMANCE INDICATORS FOR PROGRAM 5 – SIEF[45]**

| KEY PERFORMANCE INDICATOR | 2011–12 | 2012–13 | 2013–14 |
|---|---|---|---|
| Projects involving research in areas of national priority[46] | 100% Research Projects.<br>76% Promotion of Science. | 100% Research Projects, Research Infrastructure and Special Research Program.<br>83% Promotion of Science. | 100% Research Projects, Research Infrastructure and Special Research Program.<br>84% Promotion of Science. |
| Projects involving more than one organisation[47] | >85% | >90% | >92% |
| Financial contributions of partners[47] | Approximately 57% | Approximately 69% | Approximately 68% |
| Publications from SIEF projects[47] | 79 | 158 | 226 |
| Early-career researchers funded through SIEF projects | 23[48] | 42[48] | 131[49] |

45 For all projects awarded as at 30 June 2014.
46 Data includes Research Projects, Research Infrastructure, Special Research and Promotion of Science programs. Undergraduate degree scholarships are not included: there is no expectation they will address national priorities, collaborate, co-invest or publish. Cumulative for all projects awarded up to 30 June 2014.
47 Cumulative for all projects awarded up to 30 June 2014.
48 Promotion of Science Program only (including undergraduate scholarships).
49 Performance indicator expanded in 2013–14 to cover Research Projects Program.

### Proportion of projects involving research in areas of national priority

A key selection criterion for funded programs is the project's contribution to addressing national challenges.

This carries greater emphasis for the more substantial Research Projects, Research Infrastructure and Special Research program grants. All projects funded through these programs align with National Research Priority areas.

Recent grants include funding to develop:

- The National Resource Characterisation Facility, which forms part of the globally significant National Resource Sciences Precinct in Perth, Western Australia. This facility will increase the amount and quality of geoscientific information gained from drilling. Such information forms the basis for higher ore deposit discovery rates and earlier, more accurate resource definition, facilitating a more internationally competitive Australian resources sector.
- The Australian Square Kilometre Array Pathfinder. When fully commissioned, it will be the world's largest, most sensitive survey radio telescope. It is also a precursor to the international Square Kilometre Array radio telescope.

SIEF's Promotion of Science Program supports early-career researchers, primarily through postgraduate scholarships and postdoctoral fellowships. An emphasis on collaborative, cross-disciplinary projects continues to result in a significant proportion (84 per cent) of Promotion of Science grants addressing national challenges, such as:

- anticipating and combating insecticide resistance
- systems biology for discovery of new cancer drugs
- ultra-high capacity petabyte optical discs for low energy consumption big data centres.

### Proportion of projects involving more than one organisation

Collaboration is a key (but not mandatory) selection criterion for most funded projects. Fifteen of 17 SIEF-funded Research Projects are collaborations. The number of partners ranges between one and seven (average 3.5), with a total 36 different partners involved in one or more Research Projects.

For the Research Infrastructure Program, key stakeholders must jointly submit a suitable proposal. Under the Special Research Program, funds may go to a single organisation, but facilities supported are designed to be collaborative. Most Promotion of Science Program scholars/fellows have co-supervisors from more than one organisation.

Over 60 organisations are involved in SIEF-funded projects, representing national and international research organisations and industry/end users. These partnerships assist SIEF-funded projects to be competitive globally, promote enduring collaborations and create multidisciplinary teams that will benefit Australian science.

### Financial contributions of partners

In addition to research partner contributions, industry/end users have provided nearly $10 million in co-investments to a range of SIEF-supported projects. Over 90 per cent of SIEF projects have leveraged funds from other organisations.

### Number of publications from SIEF projects

Publications are a lagging indicator. Projects generally have a three to five-year lifespan and most commenced relatively recently (2011–12). Publication generally occurs towards the end of the project. Publication numbers have continued to increase year-in-year. As early projects and the initial scholarship and fellowship recipients finish, the publication rate will better represent SIEF's contribution to academic knowledge.

### Early-career researchers funded through SIEF projects

In addition to direct funding through the Promotion of Science Program, early-career researchers are also supported by and play a significantly role in most other SIEF-funded projects. In 2013–14, we expanded this performance indicator to capture the number of early-career researchers working through the Research Projects Program. This year, 131 early-career researchers were supported (68 through the Promotion of Science Program, 63 through the Research Projects Program). Within the Promotion of Science Program this was an increase of 62 per cent on the previous year.

See Appendix 4 on page 182 for more information on SIEF.


Dr Kimberley Clayfield is the first Australian to be awarded the Lawrence Sperry Award. Read more on page 114.
Image: Keld Knudsen

# Part 3 | Our organisation

At CSIRO we exist to make a positive impact and want the legacy of our work to last for many generations. We're committed to nurturing a work environment where people, innovation, collaboration and performance thrive.

Our operating model and governing legislation, authorities and activities that provide guidance to our strategic direction.

- Management and accountability | 98
- Board membership | 102
- Executive Team membership | 103

Our health, safety and environmental wellbeing is a core value of our organisation as we strive for Zero Harm.

- Health and safety | 104
- Environmental performance | 106

Our People Strategy underpins our commitment to developing and supporting our people.

- Our people | 109

Our people are renowned for their outstanding contributions to science and society.

- Awards and honours | 113

# Management and accountability

## OPERATING MODEL

Our Organisation operates within a model designed to support the successful execution of our strategy and delivery of our goals. It defines the roles, relationships and accountabilities of our leaders and operating units. It contains our processes for planning, investment, review and reporting and our CSIRO Policy Framework[50].

## LEGISLATION AND GOVERNMENT POLICY

CSIRO is an Australian Government statutory authority constituted and operating under the provisions of the *Science and Industry Research Act 1949* (SIR Act).

Our **primary functions** are to:

- carry out scientific research to:
  - assist Australian industry and to further the interests of the Australian community
  - contribute to national and international objectives and responsibilities of the Commonwealth
- encourage or facilitate the application and use of the results of CSIRO scientific research.

Our **secondary functions** include international scientific liaison, training of research workers, publication of research results, technology transfer of other research, provision of scientific services and dissemination of information about science and technology.

Reporting, accountability and other rules for our operations in 2013–14 were set out in the *Commonwealth Authorities and Companies Act 1997* (CAC Act). The CAC Act was replaced by the *Public Governance, Performance and Accountability Act 2013* on 1 July 2014.

Pursuant to a service agreement, CSIRO also provides administrative support services to the Trustee of the Science and Industry Endowment Fund consistent with the *Science and Industry Endowment Act 1926*. The Fund has its own governance structure. See pages 182–195 for more information on the Fund.

In October 2013, CSIRO submitted an annual Compliance Report to the Australian Government regarding the Organisation's compliance with the CAC Act and its financial sustainability.

General policies of the Australian Government that applied to CSIRO in 2013–14 under Section 28 of the CAC Act are: Commonwealth Fraud Control Policy, Australian Government Foreign Exchange Risk Management Guidelines, Competitive Neutrality, and Outsourcing of Information Technology Infrastructure Services. In addition, CSIRO has complied with the Commonwealth Procurement Rules.

## RESPONSIBLE MINISTER

As at 30 June 2014, the responsible Minister for CSIRO is the Hon Ian Macfarlane MP, Minister for Industry (since 18 September 2013).

**The Hon Ian Macfarlane MP, Minister for Industry**

Also during 2013–14, Senator the Hon Kim Carr, former Minister for Innovation, Industry, Science and Research and former Minister for Higher Education, was the responsible Minister for CSIRO (from 1 July to 17 September 2013).

Under the SIR Act, the Minister has power to:

- add to the purposes for which CSIRO may carry out scientific research (SIR Act, Section 9)
- provide to the CSIRO Board in writing, directions and guidelines with respect to the performance of the functions, or the exercise of the powers, of the Board or of the Organisation (SIR Act, Section 13).

There were no purposes determined by the Minister in relation to the functions of the Organisation or Ministerial directions or guidelines relating to the functions and powers of the Board.

## MINISTERIAL DIRECTIONS AND NOTIFICATIONS

No new directions were received in 2013–14. Our CSIRO Enterprise Agreement 2011–14 was developed in accordance with the Minister's direction regarding compliance with the Australian Government Employment Bargaining Framework.

Twenty-nine notifications of significant events under Section 15 and 16 of the CAC Act were made to the Minister during 2013–14. These related to participation in research centres and alliances, licence agreements, equity transactions and major research and infrastructure projects.

50 Further information can be found at: www.csiro.au/governanceoverview.

## CSIRO BOARD

We are governed by a Board[51] which is responsible to the Australian Government for the overall strategy, governance and performance of our Organisation.

The CSIRO Board comprises nine part-time, non-executive members including the Chairman, plus a full-time Chief Executive. All non-executive members are appointed by the Governor-General. The Chief Executive is appointed by the CSIRO Board, in consultation with the Minister.

In 2013–14 our Board operated partly through two standing committees:

- Board Audit and Risk Committee
- Board People, Health and Safety Committee.

On appointment, Board members receive a formal induction on the Organisation and their duties. Members maintain their professional development and to inform their decision-making participate in visits to CSIRO sites and governance and business briefings. In the pursuit of their duties, Board members may take such independent professional advice as is considered necessary and have complete access to senior management.

In mid-2013, the Chairman of the Board coordinated a self-assessment review of our Board's performance. Reviews are conducted at least every 18 months, with every second review conducted by an independent consultant commissioned by the Chairman. Board Committees review performance annually and report to the Board.

Details of our Board members, including qualifications and terms of appointment are on page 102. Details of remuneration, membership of Board Committees and attendance at meetings and related party directorships and associations are shown on pages 160, 166–167 and 169–170 in the financial statements.

## CSIRO EXECUTIVE MANAGEMENT

Our Chief Executive conducts the affairs of our Organisation in accordance with the strategy, plans and policies approved by our Board and the Board Directions to the Chief Executive.

Our Chief Executive is supported by our Executive Team. As a team and through their individual roles, the members lead, direct, coordinate and control CSIRO's operations and performance. Details of the members are on page 103.

The Executive Team is assisted by two standing committees:

- Science, Strategy, Investment and Impact Committee
- Major Transactions Committee.

In addition, a Precinct Oversight Committee steers the implementation of that key element of our CSIRO 2011–15 Strategy. The CSIRO Health, Safety and Environment Committee is accountable to the Chief Executive. This year also saw the Diversity and Inclusion Steering Committee formed.

Our Executive Management Council of senior managers provides a forum for sharing and discussing issues relating to the management and future strategy for CSIRO.

## DISCLOSURE OF INTERESTS AND RELATED ENTITY TRANSACTIONS

Board members and the Chief Executive declare material interests in accordance with the SIR Act and CAC Act, as appropriate. The Board Governance Document contains processes for managing conflicts of interest including a requirement that members absent themselves from discussions and voting, where a member has declared a material personal interest, or where a potential or actual conflict of interest or duty arises.

In 2013–14, the Board did not consider any transactions where a Board member was also a director of the other entity involved in the transaction.

## PLANNING AND MONITORING PERFORMANCE

Our CSIRO Strategy 2011–15 is our guiding document for planning and monitoring performance[52]. It outlines our broad objectives, policies and strategies to be achieved by 2015. In brief, the Strategy emphasises our intent to maintain our focus on addressing national challenges and opportunities through an enhanced program of National Research Flagships, and to continue developing Australia's scientific capability and preparedness by investing in the people and infrastructure required to meet current and future challenges. Within the context of the Strategy, our portfolio of research is decided through a planning and budgeting process guided by the twin imperatives of seeking relevance and impact for Australia.

51 The Board Charter and membership profiles are available at: www.csiro.au/boardoverview.
52 The CSIRO Strategy 2011–15 is available at: www.csiro.au/resources/CSIRO-Strategy-2011-2015.html.

**OUR PORTFOLIO OF RESEARCH IS DECIDED THROUGH A PLANNING AND BUDGETING PROCESS GUIDED BY THE TWIN IMPERATIVES OF SEEKING 'RELEVANCE' AND 'IMPACT' FOR AUSTRALIA.**

An Annual Directions Statement[53] outlines the Chief Executive's expectations of and provides guidance to management for the planning and budgeting cycle. The 2013–14 Annual Directions Statement provided direction for our organisational budget and complements our 2011–15 Strategy by linking long-term goals with short-term planning priorities designed to address current circumstances.

In accordance with the requirements of the SIR Act, our annual Operational Plan[54] sets out the strategies and activities we propose to pursue and carry out and the resources we intend to allocate to these activities. Specifically, it includes the annual delivery targets set by our Executive Team and agreed by our Board for the financial year in the form of Key Executive Actions (KEAs). An assessment of our performance against this year's KEAs is on pages 18–21.

To ensure we remain on track, our Executive Team and Board receive regular updates on how we are performing against these plans, as well as regular performance reports against our annual KEAs, our Strategy's Enterprise Strategy Measures, our budget and other internal performance indicators.

**THE QUALITY OF OUR RESEARCH IS SUBJECT TO SCIENTIFIC PEER REVIEW MECHANISMS. OUR CHIEF EXECUTIVE CONDUCTS AN ANNUAL REVIEW OF ALL RESEARCH PORTFOLIOS.**

The quality of our research is subject to scientific peer review mechanisms and our Chief Executive conducts an annual review of all research Portfolios including the Flagships, Divisions and Enterprise Functions. In addition, our Divisions and Flagships are periodically reviewed by panels chaired by independent experts who assess the strength of our capability as well as the relevance and impact of our research. The findings of those reviews are on pages 32–33 and 64–65.

## RISK MANAGEMENT

Our CSIRO Risk Policy recognises that identification and management of risk is central to delivering the functions of CSIRO and delivering benefits to Australia.

Our risk management framework provides the methodology by which our risk profile is articulated and regularly updated. It also sets out the responsibilities of all individuals across CSIRO, including the Board and management for identifying and managing risk. The framework enables enhanced risk identification, management and reporting at the executive level of our Organisation.

Risks are managed on an enterprise basis through mitigation strategies that include, in appropriate circumstances, insurance to transfer the financial impact of risk.

General insurance including General Liability and Professional Indemnity insurance and Directors and Officers Liability insurance is through Comcover. CSIRO's workers' compensation liability is covered by a premium paid to Comcare.

## ADVISORY MECHANISMS

Our Strategic Advisory Committees provide advice on our longer-term strategic directions and research and development priorities, and on how we can meet the research, technical and business needs of customers or communities. The advice provided by these committees may be complemented by Flagship Advisory Committees that focus more specifically on maximising the effectiveness of our Flagship portfolio to achieve its goals. Both committees comprise of representatives from industry, government, non-government organisations and other stakeholders.

## POLICIES, STANDARDS AND PROCEDURES

Our CSIRO Policy Framework comprises policies, standards, procedures and guidelines. It is supported by our CSIRO Delegations and Authorities Framework.

The policy statements, approved by our Board, cover our commitment in relation to:

- Science and Delivery
- People
- Governance
- Risk
- Health, Safety, Environmental Sustainability and the Community.

53 The Annual Directions Statement is a CSIRO Commercial-in-Confidence document and is therefore not publically available.
54 See: www.csiro.au/operational-plan.

There is also a policy on Freedom to Conduct CSIRO Research and Technology Transfer[55].

Documents introduced or amended this year include:

**Procedure**

- Public Interest Disclosure Scheme
- Misconduct
- Grievance
- Preventing Workplace Discrimination, Harassment and Bullying
- Induction
- CSIRO Credit Card
- HSE Audit Self-Assessment
- HSE Audit – Peer Review

**Guidelines**

- Raising concerns in CSIRO
- External Complaints Handling

## ETHICS AND THE CODE OF CONDUCT

Our CSIRO Code of Conduct sets out the standard of behaviour expected of CSIRO and of everyone working in it. The Code aligns with our Values Compass and is a key component of our staff induction program.

In addition, we have procedures on ethical conduct in human research and on the care and use of animals for scientific purposes. Our practices comply with national codes and relevant state and federal legislative requirements.

**OUR CSIRO CODE OF CONDUCT SETS OUT THE STANDARD OF BEHAVIOUR EXPECTED OF CSIRO AND OF EVERYONE WORKING IN IT.**

## INTERNAL CONTROLS

Assurances about our financial state of affairs, compliance and control environment are provided through a range of processes including the role of the Internal Audit, Risk, Legal, Fraud Control and Security units, system design and monitoring, compliance reporting by senior managers and the operation of our CSIRO Public Interest Disclosure Scheme.

At CSIRO, we comply with Commonwealth Fraud Control Guidelines. A revised Fraud Control Plan was released in April 2014. On 13 June 2014, final approval by our Chief Financial Officer, Ms Hazel Bennett, was signed and a copy was uploaded to the CSIRO intranet. This year we also progressed towards meeting the mandatory requirements of the Australian Government Protective Security Policy Framework and the Information Security Manual.

We approach compliance based on our business model and have a risk-based approach to addressing non-compliant areas. Progress is being overseen by the CSIRO Security Committee and Executive Team, who endorse all changes to security procedures within CSIRO.

## REVIEWS BY OUTSIDE BODIES

External audit is provided by the Australian National Audit Office. During 2013–14, there were no reports on the operations of CSIRO by the Auditor-General (other than on the financial statements), a Parliamentary Committee or the Commonwealth Ombudsman.

The Senate Standing Committee on Economics examines the operations of CSIRO following the Federal Budget, the tabling in Parliament of our CSIRO Annual Report and the introduction to Parliament of the additional appropriation bills later in the financial year. This year senior executives appeared before the Committee on three occasions and responded to all related questions on notice. The Committee reviewed the 2012–13 Annual Report and provided comments which have been addressed in this report.

## JUDICIAL DECISIONS

During 2013–14, there were no judicial decisions or decisions of administrative tribunals that have had, or may have, a significant effect on the operations of CSIRO.

55 Key policy statements are available at: www.csiro.au/org/Key-policy-statements.html.

## Board membership

### Mr Simon McKeon AO

(Chairman)
BCom LLB FAICD
Company Director
28 June 2010 – 27 June 2015

### Prof Peter Høj

MSc PhD DUniv
(honoris causa) FTSE
Vice Chancellor and President
University of Queensland
7 December 2011 –
6 December 2014

### Dr Eileen Doyle

(Deputy Chairman from
25 October 2012)
BMath (Hons) MMath PhD
FAICD
Company Director
15 February 2006 –
14 February 2016

### Ms Shirley In't Veld

BCom LLB
Company Director
28 June 2012 – 27 June 2015

### Dr Megan Clark AC

(Chief Executive)
BSc (Hons) PhD Hon DSc Hon
DApSc FTSE GAICD
1 January 2009 –
31 December 2014

### Mr Hutch Ranck

BSc Economics FAICD
Company Director
1 May 2011 – 30 April 2016

### Ms Jane Bennett

Company Director
25 October 2012 –
24 October 2015

### Prof Tom Spurling AM

BSc (Hons) PhD FRACI FTSE
Research Professor
Swinburne University
of Technology
1 May 2008 – 30 April 2012
Reappointed: 28 June 2012 –
27 June 2015

### Ms Mary Boydell

BCom FCA
Company Director
26 June 2009 –
25 September 2014

### Dr Peter Riddles

BSc PhD
Company Director
24 April 2014 – 23 April 2017

Details on the operation of our Board are on page 99.

# Executive Team membership

## CURRENT MEMBERS

### Dr Megan Clark AC

BSc (Hons) PhD Hon DSc Hon DApSc FTSE GAICD
Chief Executive

### Mr Craig Roy

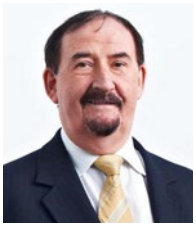
BSc MSc MBA FAICD
Deputy Chief Executive, Science, Strategy and People

### Ms Hazel Bennett

BSc (Hons) ACA FAIM
Chief Finance Officer
(Executive Director, Finance and Services from 1 July 2013)

### Dr Andrew Johnson

BAgrSc (Hons) PhD MPA
Group Executive, Environment



### Prof Maurice Moloney

BSc PhD
Group Executive, Food, Health and Life Science Industries
(from 2 December 2013)

### Dr David Williams

BSc PhD
Group Executive, Information Sciences
(from 29 November 2012)

### Dr Anita Hill

BEng (Hons) MSc PhD FTSE GAICD
Group Executive, Manufacturing, Materials and Minerals
(from 20 December 2013)

### Dr Alex Wonhas

Physik Diploma (BSc/MSc equivalent) PhD
Group Executive, Energy
(from 1 April 2014)

## PREVIOUS MEMBERS

### Mr Mike Whelan

BEc
Deputy Chief Executive, Operations
(to 30 April 2014)

### Mr Rod Bloom

BA
Executive Director, Development
(to 11 June 2014)

### Dr Tom Hatton PSM

BSc MSc PhD
Group Executive, Energy
(to 31 March 2014)

### Dr Alastair Robertson

BSc (Hons) PhD FRSC CChem FIFST
Group Executive, Food, Health and Life Science Industries
(to 2 September 2013)

### Dr Calum Drummond

BSc (Ed) BSc (Hons) PhD FTSE, FAICD, FRACI, CChem
Group Executive, Manufacturing, Materials and Minerals
(to 20 December 2013)

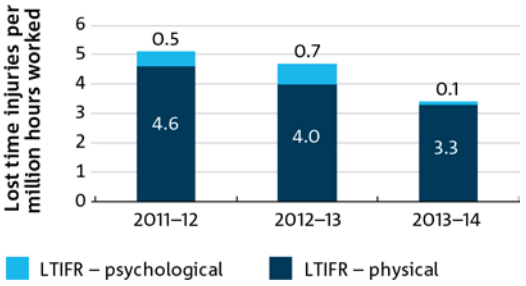
Details on our Executive management are on page 99.

## Health and safety

We are committed to providing all staff and affiliates with a work environment that is physically safe and psychologically supportive. We hold strongly to our vision of Zero Harm, in which we protect the environment and our people go home safely each day with a sense of pride and achievement.

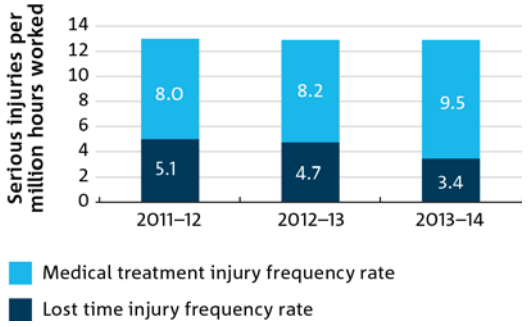
In 2013–14, our combined efforts resulted in 17 fewer staff suffering an injury serious enough to prevent them from coming to work. These injuries occurred at a rate of 3.4 per million hours worked (see Figure 3.1), 28 per cent lower than the 4.7 lost time injury frequency rate (LTIFR) of 2012–13. Such a significant reduction is testimony to the continued and dedicated effort of many of our people to live our CSIRO Values.

**FIGURE 3.1: CSIRO LOST TIME INJURY FREQUENCY RATE**




Over the last several years musculoskeletal disorders have remained the most frequent cause of injury to our people. Although not life-threatening, these injuries are always painful and often debilitating. In 2013–14, 133 of our staff experienced an injury which required time off work or medical treatment, and 50 (38 per cent) of these occurred in an office environment (see Figure 3.2). In response, the Wellnomics computer work-pace and risk management software has been installed on all Windows computers, providing our people with a rich assessment of their computer use habits. The gathered data will inform the design of future interventions including those targeting repetitive-type activities.

**FIGURE 3.2: CSIRO SERIOUS INJURY FREQUENCY RATE**

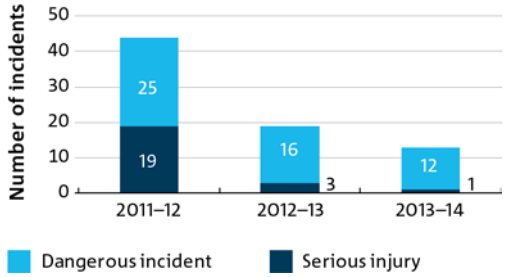



We are also focused on preventing injuries which are low frequency but have the potential to cause death or permanent disability. These high-potential incidents are typically reportable to Comcare. In 2013–14 there were 13 reportable incidents, down from 19 in 2012–13 (30 per cent reduction) (see Figure 3.3).

On 12 May 2014, Comcare issued CSIRO with an improvement notice under Section 19 of the *Work Health and Safety Act 2011* (WHS Act) related to possible exposure to dust potentially containing asbestos of three workers employed by a contractor.

Additionally there were no radiation or environmental incidents reportable to government regulators in 2013–14.

**FIGURE 3.3: COMCARE NOTIFIABLE INCIDENTS**[56]




56 The *Work Health and Safety Act 2011* came into effect on 1 January 2012, changing the criteria that determines which incidents must be notified to Comcare. This change accounts for much of the steep decline in notifiable incidents between 2011–12 and 2012–13.

**WE HOLD STRONGLY TO OUR VISION OF ZERO HARM, IN WHICH WE PROTECT THE ENVIRONMENT AND OUR PEOPLE GO HOME SAFELY EACH DAY WITH A SENSE OF PRIDE AND ACHIEVEMENT.**

## HSE STRATEGY

Our 2011–15 HSE Strategy includes several initiatives designed to improve our health, safety and environmental performance and progress our safety culture. During 2013–14, the following strategic initiatives were progressed:

- HSE leadership training for line managers continued with more than 1000 leaders now trained. This program focuses on leadership behaviours and responsibilities and prepares participants to lead our HSE agenda amongst their teams and work groups.
- A Training Officer has been recruited and has developed capabilities in eLearning authoring and video production. This role will be producing self-paced, on-demand training materials so our people have ready access to relevant and meaningful instruction at their time of need.
- Our CSIRO Wellbeing at Work Strategy was developed by Human Resources in close collaboration with our HSE team. Implementing this strategy will improve our ability to ensure our people are provided with a psychologically supportive work environment.
- A wholesale review of our injury management procedures was completed and an audit by Comcare rated this new system 92 per cent compliant with their Rehabilitation Guidelines. Key improvements included new performance metrics and a new Memorandum of Understanding with the Department of Defence which allows us to access their panel of injury management service providers.
- A fatality risk protocol has been drafted which outlines how high-potential risks are to be managed over and above our standard risk management practices. This protocol is currently being applied to fatality risks associated with all-terrain vehicles, forklifts, electrical work and pressure vessels.
- The Wellnomics computer work-pace and risk management software was installed on all Windows computers providing our people with rich data regarding their computer use habits and allowing HSE staff to intervene when computer use is creating an elevated risk.
- Contractor HSE management procedures have been rewritten and a new training program is being delivered to assist staff to identify and manage risks arising from work by contractors.
- We undertook a significant asbestos removal program to minimise the risk to health and safety of our people and minimise the potential for environmental contamination. While the program focused predominantly on removing asbestos from building structures (for example wall cladding and roof materials), we also undertook remediation of asbestos-contaminated soil at our Crace site in Canberra. The project required the removal of contaminated topsoil surrounding several buildings and replaced with new topsoil. Both the roof and contaminated soil were remediated successfully using approved contractors.
- Our internal HSE audit program continued and five business units have now been completed. These audits provide business units with an accurate assessment of the level of implementation of our HSE procedures, highlighting opportunities for further improvement.

**1000+ LEADERS HAVE COMPLETED HSE TRAINING FOR LINE MANAGERS.**

2014–15 is the final year of this HSE Strategy and the focus in the next 12 months will primarily be upon fatality prevention, musculoskeletal disorders and the continued development of a culture in which health, safety and environmental risks are recognised by all staff and the ongoing management of these risks becomes entrenched in the way we approach our work and do business.

## Environmental performance

Health, Safety and Sustainability is one of our CSIRO Values and we strive to embed environmental sustainability into our everyday business practices. Cultural and behavioural change is important to ensure we achieve our targets and reduce costs. Energy consumption, waste generation and diversion from landfill and procurement are areas where our people can incorporate sustainability in their day-to-day decision-making.

### CARBON AND ENERGY

In 2013–14, we re-focused our Carbon Emission Reduction Strategy, establishing a target of 20 per cent reduction in carbon emissions by 2020 against projected emissions. Achieving this target will reduce emissions below 1999–2000 levels and align CSIRO to the Australian Government's national emission reduction target. Though challenging, it enables us to focus on strategic initiatives to achieve long-term and sustained emission reductions including building energy efficiency, modification of laboratory and office practices, reduced air travel, increased on-site electricity generation and reduction in site and building footprint.

### BUILDING ENERGY EFFICIENCY

Our Building Energy Efficiency program aims to improve operational stability, occupant comfort, energy and emission reductions and cost savings. Current pilot projects in progress include:

- optimisation of mechanical services and the associated thermal energy storage system in one of our buildings at Black Mountain in Canberra, by installing variable speed drives, re-balancing the mechanical services system and improved building monitoring
- re-commissioning buildings at Waterford, Western Australia, with modified chiller set points and control, re-programed air handling units and improved building plant integration.

### BUILDING FOOTPRINT

Under our CSIRO 2011–15 Strategy and current Annual Directions Statement, site consolidation projects were launched in Canberra and Clayton to provide opportunities for stronger science collaboration, improved facilities and significantly reduced building footprint.

By 2020, three CSIRO Canberra sites will be consolidated into a modern, fit-for-purpose campus at Black Mountain with flexible facilities. Design highlights of the new and refurbished buildings include:

- significantly smaller building floor area, expected to reduce energy consumption per square metre and per staff member
- construction of new best practice facilities to cater for mixed-use laboratory and office needs
- refurbishing or removing ageing properties no longer fit for purpose
- greater utilisation of selected current buildings and facilities to meet future research and enterprise needs
- minimisation of current and potential health and safety risks.

**9694m³**

**DIVERTED FROM LANDFILL, EQUATING TO 998 TONNES OF CARBON EMISSIONS SAVED 2013–14.**

### WASTE AND RECYCLING

We have vastly improved our oversight of waste and recycling practices across our national sites under the CSIRO National Waste and Recycling Services Contract, leading to a projected 28 per cent cost saving to the Organisation from 2012–13. We now actively manage 23 recycling streams.

We diverted 9694 cubic metres from landfill equating to 998 tonnes of carbon emissions ($tCO_2$-e) saved in the period June 2013 to May 2014. This is a 36 per cent diversion rate from landfill for the waste and recycling streams captured under the contracted reporting. Adding recycling streams not collected under the national contract, such as printer/toner cartridges, some lighting waste and stored document destruction, increases the estimated diversion rates to approximately 40 per cent. We are on track to reach the target of 50 per cent diversion from landfill by December 2015, with continued improvement of service delivery expected.

## ENGAGEMENT

Behaviour change is a key component of achieving a cultural shift reflecting our sustainability core value. Key programs this year included:

- National Shut the Sash, targeting wasted energy, cost and safety issues from lab fume hoods sashes left open when no longer required or unattended.
- Earth Hour 2014 has evolved into a long-term call for our people to become 'Bright Sparks' and devise methods to ensure all non-essential lights are turned off when not required in work areas.
- More than 40 sites participated in Business Clean Up Week targeting electronic waste, metal, wooden crates and panels. Waste and recycling facility tours were successfully piloted.
- A washroom poster campaign to increase staff engagement in our sustainability objectives.
- In collaboration with our IT function, promoting TelePresence (a tele and video conferencing system) as part of our CSIRO Strategy to achieve a target of five per cent reduction per annum in domestic air travel and one per cent reduction in international travel.

Cross-promotions specific to program streams, combined with a cultural strategy focusing on generating staff dialogue, significantly increased staff connections across our geographically spread sites and diverse research domains.

C-Greens, our environmental sustainability staff volunteers, have impacted a range of areas, including:

- reduced organics contamination and decreased disposable water bottle usage
- increased battery recycling
- a travel app is in development enabling staff to share vehicle use and cost when arriving at the same destination
- strategies for waste and recycling collection at the Murchison Radio-astronomy Observatory and Boolardy accommodation facility to reduce volume and transport costs
- introduction of a recycling process for the lamps used in CSIRO Plant Industry's controlled environment labs
- reduced AAHL's environmental footprint by introducing reusable eating utensils to replace disposable crockery and cutlery which have to be incinerated.

Our C-Greens based at the University of Queensland's St Lucia campus also participate in the University's Green Lab program through a CSIRO partnership.

## ENVIRONMENTAL MANAGEMENT AND HERITAGE

### Belmont site remediation

Our goal to increase fibre research collaboration included relocating our fibre research facility at Belmont, Victoria, to the Australian Future Fibres Research and Innovation Centre at Deakin University Waurn Ponds campus, also in Geelong. The Belmont site is now being remediated before being sold.

### Heritage management at Crace and Black Mountain

We uphold our responsibility to protect our heritage sites and buildings. We developed management policies and updated the site heritage management plan for the Gungahlin Homestead Precinct at Crace in Canberra, to align with the *Environment Protection and Biodiversity Conservation Act 1999*.

An oral history and archival architectural recording preserved the history of two blowfly insectaries built in 1933 at Black Mountain in Canberra (since demolished). The recordings capture the buildings' history through drawings, photographs and staff recollections.

### Environmental performance

In 2013–14, our energy consumption fell slightly (one per cent) compared to the previous year (see Figure 3.4). A significant reduction in gas consumption (eight per cent) compensated for a two percent rise in electricity consumption for 2013–14. The increased electricity consumption was attributed primarily to the Pawsey Centre and the progressive rise in supercomputer processing power required to support projects such as ASKAP, both in Western Australia.

The fall in gas consumption resulted in a two percent reduction in greenhouse gas emissions, from 129 $ktCO_2e$ to 126 $ktCO_2e$. Our emissions have decreased by six per cent over the past five years, while energy consumption has remained steady. Our water consumption increased by one per cent compared to the previous year, an increase of two megalitres across the Organisation. Significant increases in water consumption at some sites (for example Kensington, also due to the Pawsey Centre) have offset large reductions at our Australian Animal Health Laboratory and Clayton sites.

Under our Carbon Emission Reduction Strategy, we have set the target of three per cent reduction in air kilometres travelled per annum. In 2013–14, we achieved a reduction in air travel of approximately six million air kilometres compared with 2012–13, a 5.2 per cent reduction (see Table 3.1). The kilometres travelled per staff member (FTE) increased slightly due to a reduction in staff numbers throughout the year.

## CSIRO research with leading environmental sustainability impact

Many of our research activities are focused on improving sustainability outcomes for Australia and broader global communities, while supporting the principles of ecologically sustainable development outlined in the *Environment Protection and Biodiversity Conservation Act 1999*. Examples of how our research contributes to ecologically sustainable development are illustrated on pages 45, 55, 56 and 68.

**FIGURE 3.4: CSIRO ENERGY AND GREENHOUSE GAS EMISSIONS (ELECTRICITY AND GAS ONLY) AND WATER CONSUMPTION**

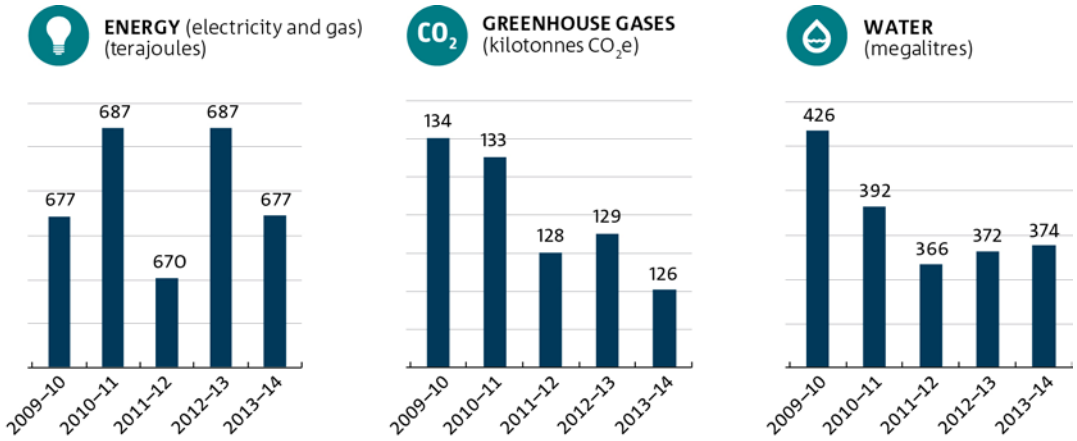



**TABLE 3.1: CSIRO ENERGY, AIR TRAVEL AND WATER INTENSITIES**

| PERFORMANCE MEASURE | INDICATOR(S) | 2009–10 | 2010–11 | 2011–12 | 2012–13 | 2013–14[57] |
|---|---|---|---|---|---|---|
| Energy | Purchased energy (electricity and gas) consumed per employee (GJ/FTE)[58] | 114 | 119 | 117 | 119 | 124 |
| Air travel | Air travel (million kilometres) | 82 | 116 | 114 | 116 | 110 |
| | Air travel per employee (km/FTE) | 13,768 | 20,069 | 19,930 | 20,214 | 20,318 |
| Relative mains water use | Amount of total water use per employee (kilolitres/FTE) | 72 | 68 | 64 | 65 | 69 |

57 Data as of July 2014
58 FTE refers to CSIRO Officers as of June 2014

## Our people

Our people and culture are fundamental to our current and future success in delivering positive impact for Australia and humanity. Guided by our Values, we seek to lift our capacity for innovation – providing the environment, facilities and opportunities our people need to work collaboratively and creatively.

Our People Strategy underpins our commitment to developing and supporting our people. Our Human Resources and Organisation Development functions provide support and leadership on people issues to leaders and staff across our Organisation as well as guidance and compliance with the *Equal Employment Opportunity (Commonwealth Authorities) Act 1997*. During 2013–14, we focused on the following areas from our People Strategy:

- Values and innovation culture
  - diversity and inclusion and embedding our Values
  - change management, especially supporting the Integrated Reform Program
  - improving service delivery and quality, especially in recruitment and service centre operations
  - code of conduct and a revision to our conduct policy
  - psychological health and wellbeing and complex case management, especially in association with the Independent Investigation into workplace bullying and other inappropriate behaviour
  - performance management
- Learning and development
  - building our leadership capability
  - developing programs and capability to address recommendations from the Independent Investigation into workplace bullying and other inappropriate behaviour
  - extending our reach and efficiency of delivery by increasing the proportion of eLearning programs within our curriculum
- Capability planning
  - design of the new line of business structure including key leadership and support roles and population of the new roles
  - workforce planning and deployment
  - Indigenous employment
  - role and accountability statements and capability profiles.

### ENTERPRISE AGREEMENTS

Enterprise agreements set the terms and conditions of employment for CSIRO staff. Two enterprise agreements are in operation: CSIRO Enterprise Agreement 2011–14 and the CSIRO Canberra Deep Space Communication Complex (CDSCC) Enterprise Agreement 2014–17.

The CSIRO Enterprise Agreement came into operation on 7 July 2011 following formal approval processes and a staff vote. This Agreement will reach its nominal expiry date in August 2014. Preliminary planning and preparations for the development of the next CSIRO Agreement were completed during 2013–14. The Australian Government Public Sector Workplace Bargaining Policy was released on 28 March 2014. It applies to the Australian Public Service (APS) and non-APS Australian Government agencies, including CSIRO. CSIRO will undertake formal bargaining to negotiate its next Agreement during 2014–15.

The CDSCC Enterprise Agreement covers non-managerial CSIRO staff employed at CDSCC, Tidbinbilla, Canberra and came into operation on 18 June 2014. It will reach its nominal expiry date in June 2017.

**GUIDED BY OUR VALUES, WE SEEK TO LIFT OUR CAPACITY FOR INNOVATION – PROVIDING THE ENVIRONMENT, FACILITIES AND OPPORTUNITIES OUR PEOPLE NEED TO WORK COLLABORATIVELY AND CREATIVELY.**

## LEARNING AND DEVELOPMENT

During 2013–14, our enterprise learning and development curriculum delivered 4855 development days, an increase of 18 per cent on the previous year. In addition to increasing demand for existing programs, six new face-to-face programs and four new eLearning programs have been introduced.

CSIRO's Enterprise Agreement provides all staff the opportunity to participate in at least five development days each year. This learning can be accessed through work experience, networking, coaching, mentoring, or through participation in formal programs. The formal program component provided by our Learning and Development function in 2013–14 represents 16 per cent of the development days our people are provided through the Enterprise Agreement, up from 13 per cent in 2012–13.

**4855 DEVELOPMENT DAYS DELIVERED VIA OUR LEARNING AND DEVELOPMENT CURRICULUM.**

## DIVERSITY AND INCLUSION

Diversity and inclusion has been an enterprise-wide focus during 2013–14 as implementation of our 2012–15 Diversity and Inclusion Plan continues. The Plan builds on the foundations of past plans and seeks to produce a step-change in our diversity and inclusion performance through enhanced leader responsibility, visibility and engagement.

Some highlights during 2013–14 include:

- continuation of the Chief Executive-led Diversity and Inclusion Steering Committee and annual progress reporting on diversity and inclusion metrics
- development of a comprehensive diversity and inclusion training curriculum targeting all staff levels. Roll-out of the first module has begun – unconscious bias training for leaders
- establishment of the Gay, Lesbian, Bisexual, Transgender and Intersex Network to provide support and social networking for our people who identify themselves in these groups
- launch of a diversity and inclusion research project to inform and improve the internal capacity of leaders to effectively engage and create value from diversity across our Organisation.

Our Indigenous Engagement Strategy, which aims to achieve greater Indigenous participation in our research and development agenda and activities, continues to progress (more on page 28).

Our Indigenous Employment Strategy aims to increase the employment of Indigenous peoples through implementing employment programs and targeted approaches. This includes Indigenous cadetship and traineeship programs for undergraduates and high school leavers that combine formal study with work-based training. As at 30 June 2014, we have 69 Indigenous employees within CSIRO. Our commitment to Indigenous employment is reflected in our CSIRO Enterprise Agreement.

Work undertaken in early 2014 to establish our new CSIRO operating model (effective 1 July 2014), included the appointment of nine new Flagship Directors. It is disappointing that no female staff were appointed to these senior leadership roles. This outcome is unacceptable to CSIRO and work is being undertaken to better understand what could have been done differently to achieve a better diversity outcome at this level. Targeted interventions have been put in place for our next layer of leaders to strengthen our merit based selection process by encouraging a wider pool of applicants, especially our target diversity groups – women, cultural and linguistically diverse staff, as well as Aboriginal and Torres Strait Islanders and staff who are under 35.

## INDEPENDENT INVESTIGATION

On 5 February 2013, the CSIRO Chief Executive, with support of the CSIRO Board, established an independent process to examine public speculation and Parliamentary scrutiny as to whether CSIRO had a 'toxic culture of workplace bullying'. The Independent Investigator appointed was Emeritus Professor Pearce AO, a former Commonwealth Ombudsman. The scope of the investigation was broad and included 'inappropriate behaviour' (that is, breaches of the CSIRO Code of Conduct), in addition to 'workplace bullying'.

The Independent Investigation ran from February 2013 to April 2014 and involved the Independent Investigator receiving submissions from former and current staff and affiliates. Professor Pearce, assisted by an investigation team from HWL Ebsworth Lawyers, provided his first General Findings Report to CSIRO on 31 July 2013. CSIRO accepted all its recommendations. Professor Pearce provided his final General Findings Report to CSIRO on 15 April 2014 and again we accepted all its recommendations. Both General Findings Reports, including their general recommendations, are public documents.

The overall outcome from the investigation was that no major or widespread issues with unreasonable behaviour or bullying was found in CSIRO. However, in some specific cases the management of concerns about conduct issues had not been fully satisfactory. The General Findings Reports provided a series of recommendations for policy and procedural changes which will move CSIRO's policies and processes to being 'state-of-the-art' in this field.

We are committed to implementing all recommendations made in the General Findings Reports, noting that in some cases, implementation will require revised arrangements under our CSIRO Enterprise Agreement. We have been working through the streams of work to be pursued in order to respond to the recommendations and to improve the management of staff welfare issues.

In addition to these, we also implemented the CSIRO Innovation Roadmap under our 2011–15 CSIRO Strategy which provides an overarching context for the implementation of the recommendations and a key component of which relates to organisational culture.

## STAFF DEMOGRAPHICS

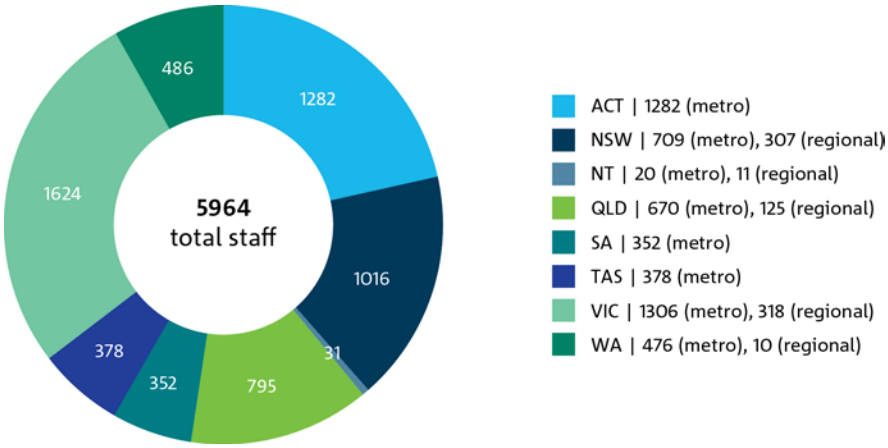
Our people are employed under Section 32 of the *Science and Industry Research Act 1949*. At 30 June 2014, CSIRO had a total of 5964 staff, which has a full-time equivalent (FTE) of 5423. Table 3.2 shows the number of staff employed in different functional areas and Figure 3.5 shows staff by state.

Overall, the total number of staff decreased by 7.9 per cent (513) over the last 12 months. Research Science staff decreased by 3.2 per cent (60). Voluntary staff turnover remained low at 4.6 per cent. The proportion of female staff stayed constant at 40 per cent and the proportion of female Research Science staff increased marginally from 24.4 to 25 per cent over the past 12 months.

**TABLE 3.2: STAFF NUMBERS (HEADCOUNT)**

| FUNCTIONAL AREA | 2009–10 | 2010–11 | 2011–12 | 2012–13 | 2013–14 | % FEMALE FOR 2013–14 |
|---|---|---|---|---|---|---|
| Research Scientists | 1,907 | 1,865 | 1,948 | 1,858 | 1,798 | 25 |
| Research Project Staff | 2,241 | 2,166 | 2,094 | 2,149 | 1,874 | 43 |
| Senior Specialists | 15 | 12 | 11 | 25 | 17 | 41 |
| Research Management | 161 | 165 | 166 | 177 | 181 | 13 |
| Research Consulting | 34 | 40 | 42 | 47 | 47 | 17 |
| Technical Services | 630 | 643 | 613 | 623 | 569 | 12 |
| Communication and Information Services | 429 | 375 | 391 | 369 | 326 | 68 |
| General Services | 48 | 56 | 40 | 38 | 34 | 59 |
| Administrative Support[59] | 1,075 | 1,048 | 1,057 | 1,068 | 980 | 76 |
| General Management | 140 | 144 | 130 | 123 | 138 | 29 |
| **Total headcount** | **6,680** | **6,514** | **6,492** | **6,477** | **5,964** | **40** |
| **FTE** | **5,956** | **5,780** | **5,720** | **5,751** | **5,423** | **37** |

**FIGURE 3.5: STAFF NUMBERS (HEADCOUNT) BY STATE**




59 Administrative Support: Staff who provide science-based administrative and management services and systems.

# Awards and honours

Outstanding performance in research is recognised by various international and national award schemes. Here are just a few examples of awards and honours granted in 2013–14 that demonstrate our effectiveness in research and its application in industry and the community and the calibre of our people[60].

## ORDER OF AUSTRALIA

The Order of Australia is the principal and most prestigious means of recognising outstanding members of the community at a national level. In 2014, five CSIRO members were recognised.

### Member (AM)

**Prof Michael McLaughlin** (Land and Water) for significant service to conservation and the environment, particularly through developing public policy on science-based strategies for minimising metals in the environment.

**Dr Sadanandan Nambiar** (Ecosystem Sciences) for distinguished service to science, particularly in the field of sustainable productivity and management of forests, as a researcher and author and as a role model for young scientists.

**Prof Michael Poole** (Plant Industry) for significant service to environmental science as a leader, researcher and advisor to government.

**Dr Ross Tellam** (Food and Health Sciences) for significant service to science through research roles in the field of livestock productivity and sustainability.

### Companion (AC)

**Dr Megan Clark** (Chief Executive) for eminent service to scientific research and development through fostering innovation, to science administration through strategic leadership roles and to the development of public policy for technological sciences.

## AUSTRALIAN MUSEUM EUREKA PRIZES 2013

Presented annually by the Australian Museum, the Eureka Prizes reward excellence in the fields of scientific research and innovation, science leadership, school science and science journalism and communication.

**The Zebedee Team** (Computational Informatics and Commercial) was awarded the ANSTO Eureka Prize for Innovative Use of Technology for their handheld 3D laser mapping system. The device uses a simple spring to overcome the cost, slow speed and technical constraints of existing systems and makes intricate 3D images of spaces previously impossible to map. The device is already being used for heritage, policing and mining applications in Australia and overseas (more on page 73).

**The Future Farm Industries CRC Enrich Project Team** (Animal Food and Health Sciences) was awarded the Caring for our Country Landcare Eureka Prize for Sustainable Agriculture. The team discovered that feeding livestock native shrubs could improve agricultural profitability by up to 24 per cent in low-to-medium rainfall areas and decrease greenhouse gas emissions and erosion. The Enrich project is a collaboration with land managers, University of Western Australia and the South Australian Research and Development Institute.

## THE SIR IAN CLUNIES ROSS AWARD

Awarded by the Australian Academy of Technological Sciences and Engineering, the Sir Ian Clunies Ross Award recognises outstanding application of science and technology that provides economic, social and/or environmental benefit to Australia.

**Dr Ezio Rizzardo**, **Dr Graeme Moad** and **Dr San Thang** (Materials, Science and Engineering) were recognised for developing better ways of making polymers and plastics, especially through the use of RAFT (Reversible Addition Fragmentation chain Transfer) technology, a living radical polymerisation process they invented and now has application across cosmetics, pharmaceuticals, paints and electronic devices.

60 Further information on our CSIRO Award recipients can be found at: www.csiro.au/Portals/About-CSIRO/Who-we-are/Staff/Awards.

## THE RANK PRIZE

The Rank Prize for human and animal nutrition and crop husbandry is awarded every two years.

**Dr Richard Richards** (Plant Industry) with Professor Graham Farquhar from the Australian National University received the 2014 Rank Prize for pioneering the understanding of isotope discrimination in plants and its application to breed water-efficient wheat varieties. The pair are the second ever Australians to win the Rank Prize.

## THE LAWRENCE SPERRY AWARD

The Lawrence Sperry Award recognises notable contributions made by a young person, age 35 or under, to the advancement of aeronautics or astronautics.

**Dr Kimberley Clayfield** (Astronomy and Space Science) received the award for significant and sustained contributions to the development of the Australian aerospace sector through national public policy, scientific leadership and education activities.

## CSIRO CHAIRMAN'S MEDAL

The CSIRO Chairman's Medal honours the very best in CSIRO research. It is awarded to the scientist or team whose research is of national or international importance in advancing scientific knowledge, technology application or commercialisation.

**The Hendra Virus Research Team** (Australian Animal Health Laboratory) was awarded the 2013 CSIRO Chairman's Medal for the pioneering research that led to the world's first horse vaccine, Equivax® HeV and human treatment against the deadly Hendra virus. This vaccine will save human lives by protecting horses from the disease, thereby breaking the only known Hendra virus transmission pathway from bats (the original carriers) to humans. The launch of the vaccine was heralded internationally as an outstanding example of the One Health approach for control of a major public health threat.

**Team members:**
Dr Deborah Middleton, Professor Linfa Wang, Professor Christopher C Broder, Dr Jackie Pallister, Gary Crameri, Dr Katharine Bossart, Reuben Klein, Dr Mark Wareing, Dr JinAn Huang, Dr Trent Monroe, Jennifer Barr, Meng Yu, Jessica Haining, Rachel Arkinstall, Dr John Bingham, Dr Dimiter S Dimitrov, Dr Zhongyu Zhu, Dr Zia Hashmi, Dr Nigel Edwards, Dr Anthony Cameron, Dr Glenn Marsh, Dr John White, Sarah-Jane Eastwood, Leah Frazer, Dr Wojtek Michalski, Jean Payne, Jennifer Harper, Dr Mark Ford, Sandy Matheson, Noel Collins, Chris Darcy, Professor Martyn Jeggo, Dr Bryan Eaton, John Muschialli.

## CSIRO MEDAL FOR LIFETIME ACHIEVEMENT

The CSIRO Medal for Lifetime Achievement is awarded to individuals who have a record of sustained and meritorious achievement over a prolonged period of CSIRO service.

**Dr Bruce Pengelly** (Ecosystem Sciences) was awarded the 2013 CSIRO Medal for Lifetime Achievement for his career spanning 44 years as a CSIRO technician, agricultural scientist, research manager and leader. Dr Pengelly has developed new pasture species for northern Australia and led pioneering research programs that today continue to benefit the livelihoods of smallholder farmers. Throughout his career, he has delivered scientific impact, people-oriented solutions and long-standing relationships in Australia, Asia and Africa.

**Members of the Hendra Virus Research Team – our 2013 CSIRO Chairman's Medal winner.**

# Part 4 | Financial statements



Farmed prawns fed with Novacq™ grow faster and provide a healthy, high-quality product for consumers. Australia's $75 million prawn farming industry was the first to benefit from Novacq™. Read more on page 45.

Australian National
Audit Office

**INDEPENDENT AUDITOR'S REPORT**

**To the Minister for Industry**

I have audited the accompanying financial statements of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity for the year ended 30 June 2014, which comprise: the Statement by the Chairman of the Board, Chief Executive and Chief Finance Officer; the Statements of Comprehensive Income; Statements of Financial Position; Statements of Changes in Equity; Cash Flow Statements; Schedules of Commitments; Schedules of Contingencies; and Notes to and forming part of the Financial Statements, comprising a Summary of Significant Accounting Policies and other explanatory information. The consolidated entity comprises the Commonwealth Scientific and Industrial Research Organisation and the entities it controlled at the year's end or from time to time during the financial year.

***Members' Responsibility for the Financial Statements***

The members of the Commonwealth Scientific and Industrial Research Organisation are responsible for the preparation of the financial statements that give a true and fair view in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997,* including the Australian Accounting Standards, and for such internal control as is necessary to enable the preparation of financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

***Auditor's Responsibility***

My responsibility is to express an opinion on the financial statements based on my audit. I have conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate Australian Auditing Standards. These auditing standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Commonwealth Scientific and Industrial Research Organisation's preparation of the financial statements that give a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Commonwealth Scientific and Industrial Research Organisation's internal control. An audit also includes

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19 National Circuit BARTON ACT 2600
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evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made by the members, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

***Independence***

In conducting my audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the requirements of the Australian accounting profession.

***Opinion***

In my opinion, the financial statements of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity:

(a) have been prepared in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997,* including the Australian Accounting Standards; and

(b) give a true and fair view of the matters required by the Finance Minister's Orders including the Commonwealth Scientific and Industrial Research Organisation's and the consolidated entity's financial positions as at 30 June 2014 and their financial performance and cash flows for the year then ended.

Australian National Audit Office

Puspa Dash
Executive Director

Delegate of the Auditor-General

Canberra
26 August 2014

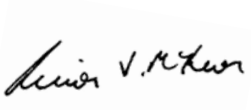
## COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
## Financial Statements
*for the period ended 30 June 2014*

**COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION**
**STATEMENT BY THE CHAIRMAN OF THE BOARD, CHIEF EXECUTIVE AND CHIEF FINANCE OFFICER**

In our opinion, the attached financial statements for the year ended 30 June 2014 are based on properly maintained financial records and give a true and fair view of the matters required by the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*, as amended.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Group will be able to pay its debts as and when they become due and payable.

This statement is made in accordance with a resolution of the Board Members.



**Simon McKeon AO**
Chairman of the Board

26 August 2014

**Megan Clark AC**
Chief Executive and Board Member

26 August 2014

**Hazel Bennett**
Chief Finance Officer

26 August 2014

**CONSOLIDATED FINANCIAL STATEMENTS**
**STATEMENT OF COMPREHENSIVE INCOME**
**For the period ended 30 June 2014**

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **NET COST OF SERVICES** | | | | | |
| **Expenses** | | | | | |
| Employee benefits | 3.1 | **741,850** | 732,035 | **741,016** | 731,918 |
| Suppliers | 3.2 | **397,489** | 415,652 | **385,698** | 401,905 |
| Depreciation and amortisation | 3.3 | **133,174** | 122,906 | **133,173** | 122,906 |
| Finance costs | 3.4 | **2,891** | 2,865 | **2,888** | 2,864 |
| Write-down and impairment of assets | 3.5 | **4,083** | 7,057 | **4,083** | 7,057 |
| Foreign exchange losses | 3.6 | **1,398** | - | **1,398** | - |
| Losses from asset sales | 3.7 | **2,369** | 874 | **2,369** | 874 |
| **Total expenses** | | **1,283,254** | 1,281,389 | **1,270,625** | 1,267,524 |
| **Own-Source Income** | | | | | |
| **Own-source revenue** | | | | | |
| Sale of goods and rendering of services | 4.1 | **383,904** | 413,356 | **394,445** | 425,162 |
| Interest | 4.2 | **13,908** | 18,070 | **9,464** | 11,529 |
| Rental income | | **7,096** | 7,176 | **7,096** | 7,176 |
| Royalties and licence fees | 4.3 | **29,133** | 37,548 | **29,133** | 37,548 |
| Other revenues | 4.4 | **27,270** | 24,882 | **26,629** | 25,353 |
| **Total own-source revenue** | | **461,311** | 501,032 | **466,767** | 506,768 |
| **Gains** | | | | | |
| Foreign exchange gains | 4.5 | **-** | 5,454 | **-** | 5,454 |
| **Total gains** | | **-** | 5,454 | **-** | 5,454 |
| **Total own-source income** | | **461,311** | 506,486 | **466,767** | 512,222 |
| **Net cost of services** | | **(821,943)** | (774,903) | **(803,858)** | (755,302) |
| **Revenue from Government** | 4.6 | **778,177** | 733,817 | **778,177** | 733,817 |
| Share of net operating surplus/(deficit) of joint venture accounted for using equity method | 9 | **(37)** | (53) | **(37)** | (53) |
| **Surplus on continuing operation** | | **778,140** | 733,764 | **778,140** | 733,764 |
| **Surplus/(Deficit) attributable to the Australian Government** | | **(43,803)** | (41,139) | **(25,718)** | (21,538) |
| **OTHER COMPREHENSIVE INCOME** | | | | | |
| **Items not subject to subsequent reclassification to net cost of services** | | | | | |
| Increase/(decrease) in asset revaluation reserves | 5.1 | **25,791** | (1,102) | **25,791** | (1,102) |
| **Items subject to subsequent reclassification to net cost of services** | | | | | |
| Increase/(decrease) in other reserves | 5.2 | **1,870** | (1,004) | **1,870** | (1,004) |
| **Total comprehensive income** | | **27,661** | (2,106) | **27,661** | (2,106) |
| **Total comprehensive income/(loss) attributable to the Australian Government** | | **(16,142)** | (43,245) | **1,943** | (23,644) |

The above Statement should be read in conjunction with the accompanying notes.

**CONSOLIDATED FINANCIAL STATEMENTS**
**STATEMENT OF FINANCIAL POSITION**
**As at 30 June 2014**

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **ASSETS** | | | | | |
| **Financial Assets** | | | | | |
| Cash and cash equivalents | 7 | **398,173** | 404,638 | **295,575** | 283,013 |
| Trade and other receivables | 8 | **71,327** | 170,199 | **67,562** | 169,841 |
| Investments accounted for using the equity method | 9 | **309** | 346 | **309** | 346 |
| Other investments | 10 | **14,621** | 10,520 | **14,621** | 10,520 |
| **Total financial assets** | | **484,430** | 585,703 | **378,067** | 463,720 |
| **Non-Financial Assets** | | | | | |
| Land and buildings | 11 | **1,563,338** | 1,563,823 | **1,563,338** | 1,563,823 |
| Plant and equipment | 12 | **548,398** | 518,426 | **548,392** | 518,426 |
| Heritage and cultural | 13 | **4,217** | 3,263 | **4,217** | 3,263 |
| Intangibles | 14 | **31,373** | 25,135 | **31,373** | 25,135 |
| Investment properties | 15 | **48,288** | 52,150 | **48,288** | 52,150 |
| Inventories | 16 | **1,180** | 1,162 | **1,180** | 1,162 |
| Other non-financial assets | 17 | **93,426** | 53,107 | **93,382** | 53,107 |
| **Total non-financial assets** | | **2,290,220** | 2,217,066 | **2,290,170** | 2,217,066 |
| Properties held for sale | 18 | **9,091** | 8,583 | **9,091** | 8,583 |
| **Total assets** | | **2,783,741** | 2,811,352 | **2,677,328** | 2,689,369 |
| **LIABILITIES** | | | | | |
| **Payables** | | | | | |
| Suppliers | 19 | **54,773** | 62,433 | **54,347** | 61,779 |
| Other payables | 20 | **181,097** | 181,462 | **177,945** | 181,053 |
| **Total payables** | | **235,870** | 243,895 | **232,292** | 242,832 |
| **Interest Bearing Liabilities** | | | | | |
| Leases | 21 | **53,475** | 57,243 | **53,475** | 57,243 |
| Deposits | 22 | **4,567** | 6,337 | **4,567** | 6,337 |
| **Total interest bearing liabilities** | | **58,042** | 63,580 | **58,042** | 63,580 |
| **Provisions** | | | | | |
| Employee provisions | 23 | **259,338** | 266,938 | **259,338** | 266,938 |
| **Total provisions** | | **259,338** | 266,938 | **259,338** | 266,938 |
| **Total liabilities** | | **553,250** | 574,413 | **549,672** | 573,350 |
| **Net assets** | | **2,230,491** | 2,236,939 | **2,127,656** | 2,116,019 |
| **EQUITY** | | | | | |
| Contributed equity | | **268,520** | 259,220 | **268,320** | 259,020 |
| Asset revaluation reserves | | **1,347,318** | 1,321,527 | **1,347,318** | 1,321,527 |
| Other reserves | | **1,501** | (369) | **1,501** | (369) |
| Retained surplus | | **613,152** | 656,561 | **510,517** | 535,841 |
| **Total equity** | | **2,230,491** | 2,236,939 | **2,127,656** | 2,116,019 |

The above Statement should be read in conjunction with the accompanying notes.

**CONSOLIDATED FINANCIAL STATEMENTS**
**STATEMENT OF CHANGES IN EQUITY – CONSOLIDATED**
**For the period ended 30 June 2014**

| | Retained earnings | | Asset revaluation reserve | | Other reserves | | Contributed equity/capital | | Total equity | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **2014** | 2013 | **2014** | 2013 | **2014** | 2013 | **2014** | 2013 | **2014** | 2013 |
| | **$'000** | $'000 | **$'000** | $'000 | **$'000** | $'000 | **$'000** | $'000 | **$'000** | $'000 |
| **Opening balance** | **656,561** | 782,911 | **1,321,527** | 1,322,629 | **(369)** | 635 | **259,220** | 149,588 | **2,236,939** | 2,255,763 |
| **Comprehensive income** | | | | | | | | | | |
| Other comprehensive income | **-** | - | **25,791**[1] | (1,102) | **1,870**[2] | (1,004) | **-** | - | **27,661** | (2,106) |
| Surplus/(deficit) for the period | **(43,803)** | (41,139) | **-** | - | - | - | **-** | - | **(43,803)** | (41,139) |
| **Total comprehensive income** | **(43,803)** | (41,139) | **25,791** | (1,102) | **1,870** | (1,004) | **-** | - | **(16,142)** | (43,245) |
| **Transactions with owners** | | | | | | | | | | |
| **Contributions by owners** | | | | | | | | | | |
| Equity injection | **-** | - | **-** | - | **-** | - | **9,300** | 109,632 | **9,300** | 109,632 |
| Payment to the Commonwealth | **394**[3] | (85,211) | **-** | - | **-** | - | **-** | - | **394** | (85,211) |
| **Closing balance** | **613,152** | 656,561 | **1,347,318** | 1,321,527 | **1,501** | (369) | **268,520** | 259,220 | **2,230,491** | 2,236,939 |

The above Statement should be read in conjunction with the accompanying notes.

1. See Note 5.1
2. See Note 5.2
3. An adjustment to the Retained Earnings Balance relating to foreign currency movements arising from the realisation of WLAN receipts that will be shared with the Commonwealth.

**CONSOLIDATED FINANCIAL STATEMENTS**
**STATEMENT OF CHANGES IN EQUITY – CSIRO**
**For the period ended 30 June 2014**

| | Retained earnings | | Asset revaluation reserve | | Other reserves | | Contributed equity/capital | | Total equity | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **2014** | 2013 | **2014** | 2013 | **2014** | 2013 | **2014** | 2013 | **2014** | 2013 |
| | **$'000** | $'000 | **$'000** | $'000 | **$'000** | $'000 | **$'000** | $'000 | **$'000** | $'000 |
| **Opening balance** | **535,841** | 642,590 | **1,321,527** | 1,322,629 | **(369)** | 635 | **259,020** | 149,388 | **2,116,019** | 2,115,242 |
| **Comprehensive income** | | | | | | | | | | |
| Other comprehensive income[1&2] | **-** | - | **25,791**[1] | (1,102) | **1,870**[2] | (1,004) | **-** | - | **27,661** | (2,106) |
| Surplus/(deficit) for the period | **(25,718)** | (21,538) | **-** | - | - | - | **-** | - | **(25,718)** | (21,538) |
| **Total comprehensive income** | **(25,718)** | (21,538) | **25,791** | (1,102) | **1,870** | (1,004) | **-** | - | **1,943** | (23,644) |
| **Transactions with owners** | | | | | | | | | | |
| **Contributions by owners** | | | | | | | | | | |
| Equity injection | **-** | - | **-** | - | **-** | - | **9,300** | 109,632 | **9,300** | 109,632 |
| Payment to the Commonwealth | **394**[3] | (85,211) | **-** | - | **-** | - | **-** | - | **394** | (85,211) |
| **Closing balance** | **510,517** | 535,841 | **1,347,318** | 1,321,527 | **1,501** | (369) | **268,320** | 259,020 | **2,127,656** | 2,116,019 |

The above Statement should be read in conjunction with the accompanying notes.

1. See Note 5.1
2. See Note 5.2
3. An adjustment to the Retained Earnings Balance relating to foreign currency movements arising from the realisation of WLAN receipts that will be shared with the Commonwealth.

**CONSOLIDATED FINANCIAL STATEMENTS**
**CASH FLOW STATEMENT**
**For the period ended 30 June 2014**

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **OPERATING ACTIVITIES** | | | | | |
| **Cash received** | | | | | |
| Receipts from Government | | **778,177** | 733,817 | **778,177** | 733,817 |
| Goods and services | | **587,827** | 573,773 | **600,654** | 585,305 |
| Interest | | **16,181** | 18,320 | **11,042** | 11,640 |
| Net GST received | | **16,685** | 7,777 | **13,644** | 6,244 |
| Deposits | | **-** | 4,274 | **-** | 4,274 |
| **Total cash received** | | **1,398,870** | 1,337,961 | **1,403,517** | 1,341,280 |
| **Cash used** | | | | | |
| Employees | | **748,224** | 718,674 | **746,966** | 718,287 |
| Suppliers | | **506,484** | 475,294 | **493,448** | 460,034 |
| Finance costs | | **2,721** | 2,695 | **2,721** | 2,695 |
| Deposits | | **4,379** | - | **4,379** | - |
| Net GST paid | | **-** | - | **-** | - |
| **Total cash used** | | **1,261,808** | 1,196,663 | **1,247,514** | 1,181,016 |
| **Net cash from operating activities** | 24 | **137,062** | 141,298 | **156,003** | 160,264 |
| **INVESTING ACTIVITIES** | | | | | |
| **Cash received** | | | | | |
| Proceeds from sales of property, plant and equipment | | **416** | 9,026 | **416** | 9,026 |
| Proceeds from sales of equity investments and intellectual property | | **291** | 138 | **291** | 138 |
| **Total cash received** | | **707** | 9,164 | **707** | 9,164 |
| **Cash used** | | | | | |
| Purchase of property, plant and equipment | | **147,951** | 175,071 | **147,944** | 174,951 |
| Equity investments | | **1,494** | 1,242 | **1,415** | 1,242 |
| Other selling costs | | **321** | 119 | **321** | 119 |
| **Total cash used** | | **149,766** | 176,432 | **149,680** | 176,312 |
| **Net cash from (used by) investing activities** | | **(149,059)** | (167,268) | **(148,973)** | (167,148) |
| **FINANCING ACTIVITIES** | | | | | |
| **Cash received** | | | | | |
| Contributed equity | | **9,300** | 109,632 | **9,300** | 109,632 |
| **Total cash received** | | **9,300** | 109,632 | **9,300** | 109,632 |
| **Cash used** | | | | | |
| Payment to the Commonwealth | | **-** | 56,921 | **-** | 56,921 |
| Other cash used | | **3,768** | 3,790 | **3,768** | 3,790 |
| **Total cash used** | | **3,768** | 60,711 | **3,768** | 60,711 |
| **Net cash from financing activities** | | **5,532** | 48,921 | **5,532** | 48,921 |
| **Net increase (decrease) in cash held** | | **(6,465)** | 22,951 | **12,562** | 42,037 |
| Cash and cash equivalents at the beginning of the reporting period | | **404,638** | 381,687 | **283,013** | 240,976 |
| **Cash and cash equivalents at the end of the reporting period** | 7 | **398,173** | 404,638 | **295,575** | 283,013 |

The above Statement should be read in conjunction with the accompanying notes.

**CONSOLIDATED FINANCIAL STATEMENTS**
**SCHEDULE OF COMMITMENTS**
**As at 30 June 2014**

| | Consolidated | | CSIRO | |
|---|---|---|---|---|
| | **2014** | 2013 | **2014** | 2013 |
| **BY TYPE** | **$'000** | $'000 | **$'000** | $'000 |
| **Commitments receivable** | | | | |
| Research and development commitments | **(418,985)** | (410,568) | **(418,985)** | (410,568) |
| Other receivables | **(33,714)** | (42,441) | **(33,714)** | (42,441) |
| Net GST receivable | **(42,281)** | (47,432) | **(39,517)** | (43,831) |
| **Total commitments receivable** | **(494,980)** | (500,441) | **(492,216)** | (496,840) |
| **Capital commitments payable** | | | | |
| Land and buildings[1] | **63,614** | 18,846 | **63,614** | 18,846 |
| Plant and equipment[2] | **21,040** | 46,260 | **21,040** | 46,260 |
| Investments[3] | **2,350** | 4,084 | **2,350** | 4,084 |
| **Total capital commitments payable** | **87,004** | 69,190 | **87,004** | 69,190 |
| **Other commitments payable** | | | | |
| Operating leases[4] | **246,662** | 265,793 | **246,662** | 265,793 |
| Research and development commitments[5] | **757,992** | 749,301 | **727,121** | 709,679 |
| Other commitments | **71,496** | 104,344 | **71,496** | 104,344 |
| **Total other commitments payable** | **1,076,150** | 1,119,438 | **1,045,279** | 1,079,816 |
| **Net commitments by type** | **668,174** | 688,187 | **640,067** | 652,166 |
| **BY MATURITY** | | | | |
| **Commitments receivable** | | | | |
| One year or less | **(270,533)** | (239,770) | **(269,364)** | (238,747) |
| From one to five years | **(191,353)** | (232,372) | **(189,765)** | (229,809) |
| Over five years | **(33,094)** | (28,299) | **(33,087)** | (28,284) |
| **Total commitments receivable** | **(494,980)** | (500,441) | **(492,216)** | (496,840) |
| **Commitments payable** | | | | |
| **Capital commitments payable** | | | | |
| One year or less | **84,514** | 57,248 | **84,514** | 57,248 |
| From one to five years | **2,490** | 11,942 | **2,490** | 11,942 |
| **Total capital commitments payable** | **87,004** | 69,190 | **87,004** | 69,190 |
| **Operating lease commitments payable** | | | | |
| One year or less | **38,927** | 36,781 | **38,927** | 36,781 |
| From one to five years | **128,891** | 144,105 | **128,891** | 144,105 |
| Over five years | **78,844** | 84,907 | **78,844** | 84,907 |
| **Total operating lease commitments payable** | **246,662** | 265,793 | **246,662** | 265,793 |
| **Other commitments payable** | | | | |
| One year or less | **440,600** | 404,293 | **427,584** | 393,031 |
| From one to five years | **365,446** | 438,571 | **347,674** | 410,377 |
| Over five years | **23,442** | 10,781 | **23,359** | 10,615 |
| **Total other commitments payable** | **829,488** | 853,645 | **798,617** | 814,023 |
| **Net commitments by maturity** | **668,174** | 688,187 | **640,067** | 652,166 |

The above Schedule should be read in conjunction with the accompanying notes.

**SCHEDULE OF COMMITMENTS (cont)**

1. Land and building commitments are outstanding contractual payments for buildings under construction.
2. Plant and equipment commitments are for the purchase of plant and equipment.
3. Investment commitments are for additional contributions to equity investments.
4. Operating leases are effectively non-cancellable and comprise:

| Nature of lease | General description of leasing arrangement |
|---|---|
| Leases for office and scientific research accommodation | Lease payments are subject to an annual increase in accordance with the terms of agreement, e.g. upward movements in the Consumer Price Index. The accommodation leases are still current and each may be renewed at the Group's option. |
| Leases for motor vehicles | No contingent rentals exist. There are no purchase options available to the Group. |
| Leases for computer equipment | The lessor provides computer equipment designated as necessary in the supply contract for general period of 2-3 years. |

5. Research and development commitments are Agreements Equally Proportionally Unperformed (AEPU) commitments payable and receivable for research and development contracts. AEPU commitments are contractual obligations where neither party has provided goods or services.

Note: Commitments are GST inclusive where relevant.

**SCHEDULE OF CONTINGENCIES**
**As at 30 June 2014**

| | Consolidated | | CSIRO | |
|---|---|---|---|---|
| | **2014** | 2013 | **2014** | 2013 |
| | **$'000** | $'000 | **$'000** | $'000 |
| **Contingent assets** | | | | |
| Claims for damages or costs and bank guarantees | **-** | 931 | **-** | 931 |
| **Total contingent assets** | **-** | 931 | **-** | 931 |
| **Contingent liabilities** | | | | |
| Claims for damages or costs | **400** | 400 | **400** | 400 |
| Financial guarantees | **294** | 45 | **294** | 45 |
| **Total contingent liabilities** | **694** | 445 | **694** | 445 |
| **Net contingent assets/(liabilities)** | **(694)** | 486 | **(694)** | 486 |

Details of each class of contingent liabilities and contingent assets listed above are disclosed in Note 25: Contingent Assets and Liabilities, along with information on contingencies that cannot be quantified.

No contingent liabilities were reported by the CRCs in which the Group is a participant.

The above Schedules should be read in conjunction with the accompanying notes.

**CONSOLIDATED FINANCIAL STATEMENTS**
**NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS**
**For the year ended 30 June 2014**

## Note 1: Summary of the significant accounting policies

### 1.1 Objective of the CSIRO and its Subsidiaries (the Group)

CSIRO is an Australian Government controlled not-for-profit entity. It is a research enterprise that aims to deliver great science and innovative solutions for industry, society and the environment.

CSIRO is structured to meet the following outcome:

Innovative scientific and technology solutions to national challenges and opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.

The continued existence of CSIRO in its present form and with its present programs is dependent on Government policy and on continuing funding by Parliament for CSIRO's administration and programs.

For the purposes of AASB 127 *Consolidated and Separate Financial Statements*, consolidated accounts are prepared to include the following subsidiaries: WLAN Services Pty Ltd (WLAN), Science and Industry Endowment Fund (SIEF), and the Fundación CSIRO Chile Research (Fundación) - refer Note 1.5.

### 1.2 Basis of Preparation of the Financial Statements

The financial statements are required by Clause 1(b) of Schedule 1 to the *Commonwealth Authorities and Companies Act 1997* and are general purpose financial statements.

CSIRO and the Group's Consolidated Financial Statements have been prepared in accordance with:

- Finance Minister's Orders (FMOs) for reporting periods ending on or after 1 July 2011; and
- Australian Accounting Standards and Interpretations issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

The financial statements have been prepared on an accrual basis and in accordance with the historical cost convention, except for certain assets and liabilities at fair value. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

The financial statements are presented in Australian dollars and values are rounded to the nearest thousand dollars unless otherwise specified.

Unless an alternative treatment is specifically required by an Accounting Standard or the FMOs, assets and liabilities are recognised in the Statement of Financial Position when, and only when, it is probable that future economic benefits will be realised and the amounts of the assets or liabilities can be reliably measured. However, assets and liabilities arising under executor contracts are not recognised unless required by an Accounting Standard. Liabilities and assets that are unrecognised are reported in the Schedule of Commitments or the Schedule of Contingencies.

Unless alternative treatment is specifically required by an Accounting Standard, income and expenses are recognised in the Statement of Comprehensive Income when, and only when, the flow, consumption or loss of economic benefits has occurred and can be reliably measured.

### 1.3 Significant Accounting Judgements and Estimates

In the process of applying the accounting policies listed in this note, CSIRO has made the following judgements that have the most significant impact on the amounts recorded in the financial statements:

- The fair value of properties classified as 'properties held for sale' has been taken to be the market value (level 1 inputs) and for 'investment properties' has been taken to be the market value (Level 2 inputs) of similar properties as determined by an independent valuer;
- The fair value of land which will continue to be used for research activities, and buildings held for specialised purposes and where there is no readily available market price has been taken to be Fair Value- Highest and Best Use (level 3 inputs), as determined by an independent valuer and CSIRO's registered valuer;
- The fair value of plant and equipment has been taken to be Fair Value – Highest and Best Use (level 3 inputs) as determined by an independent valuer; and
- Regarding the fair value of: listed companies (level 1 inputs), unlisted companies (level 1 and 3 inputs) and commercial vehicles (level 3 inputs), gains or losses arising from changes in fair value are recognised in reserves or equity with the exception of impairment. Investments in listed companies have been assessed for impairment and the decline in fair value does not represent impairment. Hence, the total decline in fair value is recognised directly in reserves or equity.

### 1.4 New Australian Accounting Standards

*Adoption of new Australian Accounting Standard requirements*

No Accounting Standard has been adopted earlier than the application date as stated in the standard.

CSIRO has reviewed new standards, revised standards and interpretations/amending standards issued prior to the signing of the financial statements and considers that none of these have had a material financial impact. The following new or revised standards have been adopted and their implementation requires enhanced disclosures:

| |
|---|
| AASB 13 'Fair Value Measurements' |
| AASB 119 'Employee Benefits' |

*Future Australian Accounting Standard requirements*

No new or revised pronouncements were issued by the Australian Accounting Standards Board prior to the finalisation of the financial statements which are expected to have a material financial impact on the entity in future reporting periods. The following new or revised standards will be adopted and their implementation will require enhanced disclosure in future reporting periods:

| Standard | Effective for annual reporting periods beginning on or after: | Expected to be initially applied in the financial year ending |
|---|---|---|
| AASB 10 'Consolidated Financial Statements' | 1 July 2013 | 30 June 2015 |
| AASB 11 'Joint Arrangements' | 1 January 2014 | 30 June 2015 |
| AASB 12 'Disclosure of Interests in Other Entities' | 1 July 2013 | 30 June 2015 |
| AASB 1055 'Budgetary Reporting' | 1 July 2014 | 30 June 2015 |
| AASB 9 'Financial Instruments' | 1 January 2015 | 30 June 2017 |

### 1.5 Consolidation

AASB 127 *Consolidated and Separate Financial Statement* requires a parent entity that is in a group to present consolidated financial statements that consolidate its investments in controlled entities in accordance with AASB 127. The parent and controlled entities apply consistent accounting policies and the effects of all transactions and balances between the entities are eliminated in full. The financial statements of the controlled entities are prepared for the same reporting period as the parent entity.

The consolidated financial statements incorporate the assets and liabilities of all entities controlled by CSIRO as at 30 June 2014 and the results of the controlled entities for the year then ended.

The Fundación operates in a jurisdiction that reports on a calendar year basis. CSIRO has been granted an exemption by the Minister for Finance for the Fundación to operate and report with an annual accounting period different to its parent entity CSIRO.

### 1.6 Revenue

Revenue from sale of goods is recognised when:

- The risks and rewards of ownership have been transferred to the buyer;
- The entity retains no managerial involvement or effective control over the goods;
- The revenue and transaction costs incurred can be reliably measured; and
- It is probable that the economic benefits associated with the transaction will flow to the entity.

Revenue from rendering of services is recognised by reference to the stage of completion of contracts at the reporting date. The revenue is recognised when:

- The amount of revenue, stage of completion and transaction costs incurred can be reliably measured; and
- It is probable that the economic benefits associated with the transaction will flow to the entity.

The stage of completion of contracts at the reporting date is determined by reference to the proportion that costs incurred to date bear to the total costs of the transaction. The balances of contract research and development activities in progress are accounted as either contract research work in progress (Note 17), being the gross unbilled amount expected to be collected from clients for contract research and services performed as at 30 June 2014, or contract research revenue received in advance (Note 20), where revenue for contract research and services received and/or billed exceeded revenue earned.

Receivables for goods and services, which have 30 day terms, are recognised at the nominal amounts due less any impairment allowance. Collectability of debts is reviewed on an ongoing basis and allowances are made when collectability of the debt is no longer probable.

Interest revenue is recognised using the effective interest method as set out in AASB 139 *Financial Instruments: Recognition and Measurement*.

Royalties and licence revenue are recognised on an accrual basis in accordance with the substance of the relevant royalty agreements.

Revenue from legal settlements related to intellectual property are recognised on an accrual basis in accordance with the substance of the relevant licensing agreements.

Revenue disclosed in Note 4.4 Other Revenues-Other, includes sale of CSIRO publications and products, conferences and ‘pass through’ funding for costs of suppliers and external service providers.

*Revenues from Government*

Funding received from the Australian Government Department of Industry (appropriated to CSIRO as a CAC Act body payment item) is recognised as Revenue from Government unless it is in the nature of an equity injection or a loan.

**1.7 Gains**

*Resources Received Free of Charge*

Resources received free of charge are recognised as either revenue or gains depending on their nature. They are recorded as revenue when, and only when, the fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of those resources is recognised as an expense.

Contributions of assets at no cost of acquisition or for nominal consideration are recognised as gains at their fair value when the asset qualifies for recognition, unless received from another Government agency or authority as a consequence of a restructuring of administrative arrangements.

*Sale of Assets*

Gains from disposal of non-current assets are recognised when control of the asset has passed to the buyer.

**1.8 Transactions with the Government as Owners**

*Equity Injections*

Amounts that are designated as equity injections for a year are recognised directly in contributed equity in that year.

**1.9 Research and Development Expenditure and Intellectual Property**

All research and development costs, including costs associated with protecting intellectual property (e.g. patents and trademarks) are expensed as incurred.

**1.10 Employee Benefits**

Liabilities for short-term employee benefits (as defined in AASB 119) and termination benefits due within twelve months of the end of the reporting period are measured at their nominal amounts. The nominal amount is calculated with regard to the rate expected to be paid on settlement of the liability.

Other long-term employee benefit liabilities are measured at the present value of the estimated future cash outflows to be made in respect of services provided by employees up to the reporting date.

*Leave*

The liability for employee benefits includes provisions for annual leave, long service leave and severance payments. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees is estimated to be less than the annual entitlement for sick leave.

The leave liabilities are calculated on the basis of employees' remuneration at the estimated salary rates that will apply at the time the leave is taken, including the employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination.

The liability at 30 June 2014 for long service leave and annual leave has been determined by the short hand method and reference to the work of the Australian Government Actuary (AGA).

*Separation and Redundancy*

Provision is made for separation and redundancy benefit payments. A CSIRO plan of termination is binding when the following criteria are met:

a) actions required to complete the plan indicate that it is unlikely that significant changes to the plan will be made;

b) the plan identifies the number of employees whose employment is to be terminated; and

c) the plan established the termination benefits that employees will receive.

*Superannuation*

Employees of CSIRO are members of the Commonwealth Superannuation Scheme (CSS), the Public Sector Superannuation Scheme (PSS), or the PSS accumulation plan (PSSap). The CSS and PSS are defined benefit schemes for the Australian Government. The PSSap is a defined contribution scheme.

The liability for defined benefits is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course. This liability is reported by the Department of Finance as an administered item.

CSIRO makes employer contributions to the employee superannuation schemes at rates determined by an actuary to be sufficient to meet the cost to the Government of the superannuation entitlements of the Group's employees. CSIRO accounts for the contributions as if they were contributions to defined contribution plans.

The liability for superannuation recognised as at 30 June 2014 represents outstanding contributions for the financial year.

**1.11 Workers' Compensation**

CSIRO's workers' compensation liability is covered by the premium paid to the Commission for the Safety, Rehabilitation and Compensation of Commonwealth Employees (Comcare) and no additional provision for liability is required.

**1.12 Insurance**

As part of its risk management strategy, CSIRO has insured for risks through the Australian Government's insurable risk managed fund 'Comcover'.

**1.13 Cash**

Cash and cash equivalents includes cash on hand and demand deposits in bank accounts with an original maturity of six months or less that are readily convertible to known amounts of cash and subject to insignificant risk of change in value. Cash is recognised at its nominal amount.

**1.14 Financial Assets**

CSIRO classifies its financial assets in the following categories:

- Available for sale financial assets; and
- Loans and receivables.

The classification depends on the nature and the purpose of financial assets and is determined at the time of initial recognition.

Financial assets are recognised and derecognised upon trade date.

*Effective Interest Method*

The effective interest method is a method of calculating the amortised cost of a financial asset and of allocating interest income over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts through the expected life of the financial asset or, where appropriate, a shorter period.

Income is recognised on an effective interest rate basis.

*Available-for-Sale Financial Assets*

Available-for-sale financial assets are non-derivatives that are either designated in this category or not classified in any of the other categories.

Available-for-sale financial assets are recorded at fair value. Gains and losses arising from changes in fair value are recognised directly in the reserves (equity) with the exception of impairment losses. Interest is calculated using the effective interest method and foreign exchange gains and losses on monetary assets are recognised directly in profit or loss. Where the asset is disposed of or is determined to be impaired, part (or all) of the cumulative gain or loss previously recognised in the reserve is included in the operating result for the period.

CSIRO has investments in a number of unlisted start-up companies over which it does not have significant influence or control. These companies have been established for the purpose of commercialisation of CSIRO's intellectual property.

CSIRO also has some investments in companies which have, since initial start-up, been listed on the Australian Stock Exchange.

CSIRO's investments in listed and unlisted companies are accounted for in accordance with AASB 139 *Financial Instruments: Recognition and Measurement*, and have been designated as 'available-for-sale' financial assets.

*Fair value of Investments in Listed Companies*

The fair value of investments in listed companies has been determined by reference to their closing bid price at the reporting date.

*Fair value of Investments in Unlisted Companies*

For investments in unlisted companies where there is no readily available market pricing for the equity instruments, the fair value has been determined by applying valuation techniques in line with the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation (IPEV) Guidelines'.

Where recent transactions for the unlisted companies' equity have taken place, these equity transaction prices are used to value CSIRO's investment.

For unlisted companies that have not had any recent equity transactions, other IPEV valuation techniques are used such as discounted cash flows and share of net assets.

In addition, independent valuations are performed as at reporting date for unlisted companies that are considered to have a material impact on CSIRO's investment portfolio.

Investments in special purpose entities are either valued at cost or share of net realisable assets since a reliable estimate of fair value cannot be established. These entities have been set up primarily to gain access to research facilities/networks, or to provide services to owners. Hence, there is no 'active market' for these equity investments. CSIRO is a long-term shareholder and is unlikely to dispose of its interest in these investments.

*Loans and Receivables*

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market, are classified as 'loans and receivables'. Loans and receivables are measured at amortised cost using the effective interest method less impairment. Interest is recognised by applying the effective interest rate.

*Impairment of Financial Assets*

Financial assets are assessed for impairment at each reporting date.

*Financial assets held at amortised cost*

Where there is objective evidence that an impairment loss has been incurred for loans and receivables, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the asset's original effective interest rate. The carrying amount is reduced by way of an allowance account. The loss is recognised in the Statement of Comprehensive Income.

*Available-for-sale financial assets*

Where there is objective evidence that an impairment loss on an available-for-sale financial asset has been incurred, the amount of the difference between its cost, less principal repayments and amortisation, and its current fair value, less any impairment loss previously recognised in expenses, is transferred from equity to the Statement of Comprehensive Income.

*Available-for-sale financial assets (held at cost)*

Where there is objective evidence that an impairment loss has been incurred, the amount of the impairment loss is the difference between the carrying amount of the asset and the present value of the estimated future cash flows discounted at the current market rate for similar assets.

**1.15 Financial liabilities**

Financial liabilities are recognised and derecognised upon trade date.

Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

**1.16 Acquisition of Assets**

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Financial assets are initially measured at their fair value plus transaction costs where appropriate.

Assets acquired at no cost or for nominal considerations are initially recognised as assets and revenues at their fair value at the date of acquisition.

Property, plant and equipment which are purchased from contract research funds and where the control and subsequent sale proceeds are refunded to contributors under the terms of the agreements, are expensed during the year of purchase. Separate records for these assets are maintained and disclosed in Note 27.

**1.17 Property, Plant and Equipment including Land, Buildings and Heritage and Cultural Assets**

*Asset Recognition Threshold*

Purchases of property, plant and equipment are recognised initially at cost in the Statement of Financial Position, except for purchases costing less than $3,000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total).

The initial cost of an asset includes an estimate of the cost of dismantling and removing the item and

restoring the site on which it is located.

*Revaluations*

Following initial recognition at cost, property, plant and equipment, including assets under finance leases are carried at fair value less accumulated depreciation and accumulated impairment losses. Valuations are conducted with sufficient frequency to ensure the carrying amount of assets do not differ materially from the assets' fair value as at reporting date. The regularity of valuation depends upon the volatility of movements in the market values for the relevant assets.

Revaluation adjustments are made on a class basis. Any revaluation increment is credited to equity under asset revaluation reserve, except to the extent that it reverses a previous revaluation decrement of the same asset class that was previously recognised in the surplus or deficit. Revaluation decrements for a class of assets are recognised directly through surplus/deficit except to the extent that they reverse a previous revaluation increment for that class.

Any accumulated depreciation as at the revaluation date is restated proportionately with the change in the gross carrying amount of the asset so that the carrying amount of the asset after revaluation equals its revalued amount.

Fair value for each class of asset is determined as follows:

- Land which will continue to be used for research activity is valued by independent valuers at Fair Value –Highest and Best Use. Highest and Best Use is determined from the perspective of market participants. An entity's current use of a non-financial asset is presumed to be its highest and best use unless market or other factors suggest otherwise;
- Buildings and leasehold improvements which will continue to be used for research activities are valued by CSIRO's registered valuer at their Highest and Best Use. Building valuations include plant, fit-outs, fixtures and fittings, which form an integral part of buildings;
- Plant and equipment which will continue to be used for research activities are valued by independent valuers, at fair value being the Highest and Best Use; and
- Properties held or identified for sale and investment properties are valued by independent valuers as at the reporting date.

*Depreciation and Amortisation*

Depreciable property, plant and equipment assets are written-off to their estimated residual values over their estimated useful lives using, in all cases, the straight-line method of depreciation. Leasehold improvements are depreciated on a straight-line basis over the lesser of the estimated useful life of the improvements or the unexpired period of the lease. Land is not depreciated.

Depreciation/amortisation rates (useful lives), residual values and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

Depreciation rates applying to each class of depreciable asset are based on the following useful lives:

| | 2014 | 2013 |
|---|---|---|
| Buildings on freehold land | 30 to 50 years | 30 to 50 years |
| Leasehold improvements | Lease term | Lease term |
| Buildings under finance lease | Lease term | Lease term |
| Passenger vehicles | 7 years | 7 years |
| Agricultural and transport equipment | 3 to 20 years | 3 to 20 years |
| Computing equipment | 2 to 5 years | 2 to 5 years |
| Scientific equipment | 5 to 20 years | 5 to 20 years |
| Furniture and office equipment | 5 to 15 years | 5 to 15 years |
| Workshop equipment | 20 to 25 years | 20 to 25 years |
| Research vessel | 25 years | 25 years |
| Australia Telescope | 15 to 58 years | 15 to 58 years |
| Heritage and Cultural Assets | Indefinite | Indefinite |

*Impairment*

All assets were assessed for impairment as at 30 June 2014. Where indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

The recoverable amount of an asset is the higher of its fair value less costs to sell and its value in use. Value in use is the present value of the future cash flows expected to be derived from the asset. Where the future economic benefit of an asset is not primarily dependent on the asset's ability to generate future cash flows, and the asset would be replaced if the entity were deprived of the asset, its value in use is taken to be its depreciated replacement cost.

*Derecognition*

An item of property, plant and equipment is derecognised upon disposal or when no further future economic benefits are expected from its use or disposal.

*Heritage and Cultural Assets*

Heritage and cultural items include: buildings of historical or cultural significance. The CSIRO has classified them as heritage and cultural assets as they are primarily used for purposes that relate to their cultural significance and original purpose. Heritage and cultural assets are stored and managed in ways to preserve their heritage and cultural value over time. Where conservation and preservation activities, specified in an asset's Heritage Management Plan, demonstrates that an asset will be maintained for an indefinite period, these items are considered to have indefinite useful lives and therefore, not subject to depreciation. Copies of the Heritage Management Plans may be obtained by contacting enquiries@CSIRO.au.

**1.18 Intangibles**

Intangibles comprise licenses, and internally developed and acquired software for internal use. These assets are carried at cost less accumulated amortisation and impairment losses, except where the estimated cost of software is less than $250,000 and expensed in the year of acquisition.

Licenses and software are amortised on a straight-line basis over its anticipated useful life. The useful lives are 2 to 10 years (2013: 2 to 10 years).

All software assets were assessed for indications of impairment as at 30 June 2014.

**1.19 Investment Properties**

Investment properties are measured initially at cost including transaction costs. Subsequent to initial recognition, investment properties are stated at fair value, which is based on active market price, adjusted if necessary, for any difference in nature, location or condition of the specific asset at the reporting date. Gains or losses arising from changes in the fair values of investment properties are recognised in the Statement of Comprehensive Income in the year in which the changes arise.

Investment properties are derecognised either when they have been disposed or when the investment property is permanently withdrawn from use and no future economic benefit is expected from its disposal. Any gains or losses on disposal of an investment property are recognised in the Statement of Comprehensive Income in the year of disposal.

**1.20 Inventories**

Inventories held for sale represent books, CD-ROMs and videos of publishing and media products. They are valued at the lower of cost and net realisable value.

### 1.21 Consumable Stores

Stocks of consumable stores, which are not held for resale, are expensed in the year of purchase. These stores mainly consist of fuel and lubricants, chemical supplies, maintenance materials and stationery. The total value is not considered material in terms of total expenditures or total assets.

### 1.22 Leases

A distinction is made between finance leases and operating leases. Finance leases effectively transfer from the lessor to the lessee substantially all the risks and rewards incidental to ownership of leased assets. An operating lease is a lease that is not a finance lease. In operating leases, the lessor effectively retains all such risks and benefits.

Where an asset is acquired by means of a finance lease, the asset is capitalised at either the fair value of the lease property or, if lower, the present value of minimum lease payments at the inception of the contract and a liability recognised at the same time and for the same amount.

The discount rate used is the interest rate implicit in the lease. Leased assets are amortised over the period of the lease. Lease payments are allocated between the principal component and the interest expense.

Operating lease payments are expensed on a straight-line basis which is representative of the pattern of benefits derived from the leased assets.

### 1.23 Foreign Currency Transactions

Transactions denominated in a foreign currency are translated at the exchange rate prevailing at the date of the transaction. Foreign currency receivables and payables are translated at the exchange rates prevailing at reporting date. Foreign currency translation gains and losses are recognised in the operating result. The Group has not entered into specific forward exchange contracts during the reporting period.

### 1.24 Payments to the Commonwealth

In April 2012, CSIRO concluded a number of licence agreements related to the wireless networking technology patent with licensing proceeds to be received by CSIRO across the 2011-12 to 2013-14 financial years. In the 2012-13 financial year, CSIRO paid a share of the receipts to the Commonwealth under section 48(1)(a) of the *Science and Industry Research Act 1949* on the basis that the payment would be applied to the conduct of scientific research activities within precincts to be funded under the Government's Industry and Innovation Statement. CSIRO has received proceeds in the 2013-14 financial year which have not yet been shared with the Commonwealth due to the cessation of the relevant program associated with the previous Government's Industry and Innovation Statement. CSIRO remains obligated to pay the Government a further share of the receipts. CSIRO will make this payment under section 48(1)(a) of the *Science and Industry Research Act 1949* when a new program of scientific research activities to be funded by the Commonwealth is identified and agreed.

### 1.25 Taxation/Competitive Neutrality

*Taxation*

In accordance with Section 53 of the *Science and Industry Research Act 1949*, CSIRO is exempt from all forms of Australian taxation except fringe benefits tax (FBT) and the goods and services tax (GST). The Group pays applicable taxes in overseas countries.

Revenues, expenses, assets and liabilities are recognised net of GST except:

- where the amount of GST incurred is not recoverable from the Australian Taxation Office; and

- for receivables and payables.

The SIEF is exempt from income tax in Australia, WLAN is subject to all applicable taxes in Australia, and the Fundación is subject to all applicable taxes in Chile.

*Competitive Neutrality*

The Australian Government *Competitive Neutrality Guidelines for Managers* require government bodies to operate with no net competitive advantages over private sector competitors. CSIRO's competitive neutrality policy is applied to consulting and services. Neutrality is achieved by incorporating tax equivalence and rate of return components in pricing of these services.

### 1.26 Joint Arrangements

*Joint Operations – Cooperative Research Centres (CRCs)*

The proportionate interests in CRCs regarded as joint operations are disclosed in the financial statements under appropriate headings. Their primary source of funding is from the Australian Government and funding is progressively drawn down over the life of the CRCs and distributed to participants, including CSIRO and universities, for research and development purposes. CSIRO's contributions to the CRCs are expensed as incurred and funds received from CRCs are recognised as revenue to the extent that work has been performed in the Statement of Comprehensive Income. CSIRO has been a participant in 20 CRCs during the last financial year and the names of these CRCs are disclosed in Note 26.

*Joint Venture Entities – Unincorporated*

CSIRO's 33.3% interest in the Murray-Darling Freshwater Research (MDFRC) is accounted for using the equity method. Refer to Note 9 for further details.

### 1.27 Borrowings

All borrowing costs are expensed as incurred.

### 1.28 Contingent Liabilities and Contingent Assets

Contingent liabilities and contingent assets are not recognised in the Statement of Financial Position but are reported in the relevant schedules and notes. They may arise from uncertainty as to the existence of a liability or asset, or represent a liability or asset in respect of which the amount cannot be reliably measured. Contingent assets are disclosed when settlement is probable but not virtually certain and contingent liabilities are disclosed when settlement is greater than remote.

Bank guarantees issued on behalf of CSIRO are disclosed as contingent liabilities.

Bank guarantees received by CSIRO are not disclosed as contingent assets but are the subject of a footnote in Note 25: Contingent Assets and Liabilities.

### 1.29 Properties Held for Sale

Properties which are expected to be recovered primarily through sale rather than through continuing use are classified as 'properties held for sale'. Immediately before classification, the properties are remeasured in accordance with the Group's accounting policies. Thereafter, at reporting date the properties are measured at the lower of their carrying amount and fair value less cost to sell.

Impairment losses on initial classification as held for sale and subsequent gains or losses on re-measurement are recognised in the Statement of Comprehensive Income.

### 1.30 Presentation of Financial Statements

CSIRO presents in the consolidated Statement of Changes in Equity all owner changes in equity, whereas all non-owner changes in equity are presented in the consolidated Statement of Comprehensive Income.

### 1.31 Related Party Disclosure

Related entity values disclosed in Notes 4.1 – Sale of goods and rendering of services; Note 8 – Trade and other receivables, Note 19 – Trade creditors and accruals; and Note 37 – Reporting of outcome, reflect business transactions between the Group and other FMA and CAC Act agencies and any subsidiaries.

### 1.32 Comparative Balances

Comparative figures have been adjusted to conform to changes in presentation in these financial statements where required. This includes the Schedule of Commitments for the application of GST; Schedule of Contingencies for recognition of bank guarantees; Supplier Expenses for the allocation between related parties and external parties; and Heritage and Cultural Assets for the first-time disclosure of this asset class.

## Note 2: Events After the Reporting Period

At the time of completion of this note, the Group is not aware of any significant events occurring after the reporting date.

## Note 3: Expenses

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **3.1 Employee Benefits** | | | | | |
| Wages and salaries | | **551,479** | 552,725 | **550,653** | 552,618 |
| Superannuation - defined contribution plans | | **94,788** | 90,785 | **94,780** | 90,775 |
| Leave and other entitlements | | **53,264** | 80,699 | **53,264** | 80,699 |
| Separation and redundancies | | **52,396** | 20,189 | **52,396** | 20,189 |
| **Gross employee benefits** | | **751,927** | 744,398 | **751,093** | 744,281 |
| Less | | | | | |
| Capitalised labour | | **(9,889)** | (12,354) | **(9,889)** | (12,354) |
| Employee cost recovery from subsidiary companies | | **(188)** | (9) | **(188)** | (9) |
| **Total employee benefits** | | **741,850** | 732,035 | **741,016** | 731,918 |
| | | | | | |
| **3.2 Suppliers** | | | | | |
| **Goods and services supplied or rendered** | | | | | |
| Goods | | **66,202** | 67,247 | **65,192** | 67,246 |
| Services | | **318,040** | 333,733 | **307,263** | 319,989 |
| **Total goods and services supplied or rendered** | | **384,242** | 400,980 | **372,455** | 387,235 |
| | | | | | |
| **Goods supplied in connection with** | | | | | |
| Related parties | | **575** | 928 | **575** | 928 |
| External parties | | **65,627** | 66,319 | **64,617** | 66,318 |
| **Total goods supplied** | | **66,202** | 67,247 | **65,192** | 67,246 |
| | | | | | |
| **Services rendered in connection with** | | | | | |
| Related parties | | **16,064** | 15,125 | **16,064** | 15,125 |
| External parties | | **301,976** | 318,608 | **291,199** | 304,864 |
| **Total services rendered** | | **318,040** | 333,733 | **307,263** | 319,989 |
| **Total goods and services supplied or rendered** | | **384,242** | 400,980 | **372,455** | 387,235 |
| | | | | | |
| **Other supplier expenses** | | | | | |
| Operating lease rentals | | | | | |
| Minimum lease payments | | **8,920** | 9,812 | **8,920** | 9,812 |
| Workers compensation expenses | | **4,327** | 4,860 | **4,323** | 4,858 |
| **Total other supplier expenses** | | **13,247** | 14,672 | **13,243** | 14,670 |
| **Total supplier expenses** | | **397,489** | 415,652 | **385,698** | 401,905 |
| | | | | | |
| **3.3 Depreciation and amortisation** | | | | | |
| **Depreciation** | | | | | |
| Buildings and leasehold improvements | | **74,018** | 71,225 | **74,018** | 71,225 |
| Plant and equipment | | **53,576** | 47,568 | **53,575** | 47,568 |
| Heritage Buildings | | **-** | - | **-** | - |
| **Total depreciation** | | **127,594** | 118,793 | **127,593** | 118,793 |
| | | | | | |
| **Amortisation** | | | | | |
| Intangibles | | **5,580** | 4,113 | **5,580** | 4,113 |
| **Total depreciation and amortisation** | | **133,174** | 122,906 | **133,173** | 122,906 |
| | | | | | |
| **3.4 Finance Costs** | | | | | |
| Finance leases | | **2,891** | 2,865 | **2,888** | 2,864 |

## Note 3: Expenses (cont)

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **3.5 Write-down and impairment of assets** | | | | | |
| Asset write-downs and impairments from | | | | | |
| Bad debts | | **600** | 593 | **600** | 593 |
| Increase/(decrease) in allowance for impairment of receivable | | **(190)** | (693) | **(190)** | (693) |
| Impairment of available for sale investments | | **397** | 6,167 | **397** | 6,167 |
| Net impairment loss on revaluation of properties held for sale and investment properties | | **3,167** | 650 | **3,167** | 650 |
| Net realisation of fair value loss reserve on available for sale investments | | **6** | 340 | **6** | 340 |
| Impairment of buildings | | **103** | - | **103** | - |
| **Total write-down and impairment of assets** | | **4,083** | 7,057 | **4,083** | 7,057 |
| **3.6 Foreign exchange losses** | | | | | |
| Non-speculative | | **1,398** | - | **1,398** | - |
| **3.7 Losses from Asset Sales** | | | | | |
| **Equity investment and intellectual property** | | | | | |
| Proceeds from sale of equity investments | | **(42)** | - | **(42)** | - |
| Proceeds from sale of intellectual property | | **(1,503)** | (138) | **(1,503)** | (138) |
| Total proceeds | | **(1,545)** | (138) | **(1,545)** | (138) |
| Carrying value of assets sold | | **35** | - | **35** | - |
| Selling expense | | **8** | - | **8** | - |
| **Net (gain)/loss from equity investment and intellectual property** | | **(1,502)** | (138) | **(1,502)** | (138) |
| **Land and buildings** | | | | | |
| Proceeds from sale | | **-** | (4,931) | **-** | (4,931) |
| Carrying value of assets sold | | **34** | 5,013 | **34** | 5,013 |
| Selling expense | | **303** | 104 | **303** | 104 |
| **Net (gain)/loss from sale of land and buildings** | | **337** | 186 | **337** | 186 |
| **Plant and equipment** | | | | | |
| Proceeds from sale | | **(416)** | (505) | **(416)** | (505) |
| Carrying value of assets sold | | **3,926** | 1,316 | **3,926** | 1,316 |
| Selling expense | | **10** | 15 | **10** | 15 |
| **Net (gain)/loss from sale of plant and equipment** | | **3,520** | 826 | **3,520** | 826 |
| **Investment Properties** | | | | | |
| Proceeds from sale | | **-** | - | **-** | - |
| Carrying value of assets sold | | **14** | - | **14** | - |
| Selling expense | | **-** | - | **-** | - |
| **Net (gain)/loss from sale of investment properties** | | **14** | - | **14** | - |
| **Total losses from asset sales** | | **2,369** | 874 | **2,369** | 874 |

## Note 4: Own-Source Income

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **4.1 Sale of goods and rendering of services** | | | | | |
| **Sale of goods in connection with** | | | | | |
| Related parties | | **-** | - | **-** | - |
| External parties | | **10,236** | 11,052 | **10,236** | 11,052 |
| **Total sale of goods** | | **10,236** | 11,052 | **10,236** | 11,052 |
| **Rendering of services in connection with** | | | | | |
| Related parties | | **148,192** | 108,452 | **158,732** | 120,863 |
| External parties | | **225,476** | 293,852 | **225,477** | 293,247 |
| **Total rendering of services** | | **373,668** | 402,304 | **384,209** | 414,110 |
| **Total sale of goods and rendering of services** | | **383,904** | 413,356 | **394,445** | 425,162 |
| **4.2 Interest** | | | | | |
| Bank and term deposits | | **13,908** | 18,070 | **9,464** | 11,529 |
| **4.3 Royalties and licence fees** | | | | | |
| Royalties and licence fees | | **29,133** | 37,548 | **29,133** | 37,548 |
| **4.4 Other revenues** | | | | | |
| Sale of primary produce | | **1,064** | 1,721 | **1,064** | 1,721 |
| Donation | | **153** | 51 | **153** | 51 |
| Capital contributions | | **3,329** | 3,014 | **4,529** | 3,014 |
| Education programs and subscriptions | | **3,439** | 3,185 | **3,439** | 3,185 |
| Other | | **19,285** | 16,911 | **17,444** | 17,382 |
| **Total other revenues** | | **27,270** | 24,882 | **26,629** | 25,353 |
| **4.5 Foreign exchange gains** | | | | | |
| Non-speculative | | **-** | 5,454 | **-** | 5,454 |
| **4.6 Revenue from Government** | | | | | |
| Department of Industry CAC Act body payment item | | **778,177** | 733,817 | **778,177** | 733,817 |

## Note 5: Other comprehensive income

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **Items that will not be classified to profit or loss** | | | | | |
| **5.1 Changes in asset revaluation reserves** | | | | | |
| Revaluation of land and buildings | | **24,837** | - | **24,837** | - |
| Revaluation of plant and equipment | | **-** | (1,102) | **-** | (1,102) |
| Revaluation of Heritage and Cultural assets | | **954** | - | **954** | - |
| **Net decrease in asset revaluation reserves** | | **25,791** | (1,102) | **25,791** | (1,102) |
| **Items that may be reclassified to profit and loss** | | | | | |
| **5.2 Change in other reserve** | | | | | |
| Net change in fair value gain/(loss) of available for sale of investments | | **1,864** | (1,344) | **1,864** | (1,344) |
| Realisation of fair value loss on sale and impairment of available for sale investment | | **6** | 340 | **6** | 340 |
| **Net increase/(decrease) in other reserve** | | **1,870** | (1,004) | **1,870** | (1,004) |

## Note 6: Fair value measurements

The following tables provide an analysis of assets and liabilities that are measured at fair value.
The different levels of the fair value hierarchy are defined below.

Level 1: Quoted prices (unadjusted) in active markets for identical assets or liabilities that the entity can access at measurement date.
Level 2: Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly or indirectly.
Level 3: Unobservable inputs for the asset or liability.

**6.1 Fair value measurements**

**Fair value measurements at 30 June 2014 by hierarchy for assets and liabilities**

| | **Fair value measurements at the end of the reporting period using** | | | |
|---|---|---|---|---|
| | **Fair value** | **Level 1 inputs** | **Level 2 inputs** | **Level 3 inputs** |
| | **$'000** | **$'000** | **$'000** | **$'000** |
| **Financial assets** | | | | |
| Available for sale financial assets | **14,621** | **5,643** | **-** | **8,978** |
| **Total financial assets** | **14,621** | **5,643** | **-** | **8,978** |
| **Non-financial assets** | | | | |
| Land | **365,868** | **-** | **365,868** | **-** |
| Buildings | **1,197,470** | **-** | **-** | **1,197,470** |
| Property, plant and equipment | **548,398** | **-** | **-** | **548,398** |
| Investment Properties | **48,288** | **-** | **48,288** | **-** |
| Properties Held For Sale | **9,091** | **9,091** | **-** | **-** |
| Heritage and Cultural | **4,217** | **-** | **-** | **4,217** |
| **Total non-financial assets** | **2,173,332** | **9,091** | **414,156** | **1,750,085** |
| **Total fair value measurements (assets)** | **2,187,953** | **14,734** | **414,156** | **1,759,063** |

**6.2 Valuation technique and inputs for Level 2 and Level 3 fair value measurements**

| | Category (Level 2 or 3) | Fair Value $'000 | Valuation technique[1] | Inputs used | Range (weighted average)[2] |
|---|---|---|---|---|---|
| **Financial Assets** | | | | | |
| Available for sale financial assets[3] | **Level 3** | **8,978** | Share of net assets.<br>Latest equity or unit transaction price.<br>Contract value. | Net assets.<br>Percentage shareholding.<br>Equity or unit transaction price.<br>Contract value | N/A |
| **Non-financial assets** | | | | | |
| Land[4] | **Level 2** | **365,868** | Active and liquid market approach. | Market value of similar properties.<br>Dollar rate per square metre.<br>Derived escalation rate on similar land sales. | N/A |
| Buildings[4] | **Level 3** | **1,197,470** | Depreciated replacement cost approach. | Escalation rate on construction cost change.<br>Market value of similar properties. | N/A |
| Property, plant and equipment[5] | **Level 3** | **548,398** | Depreciated replacement cost approach. | Observable inputs such as the market value of similar P&E. | N/A |
| Investment Properties | **Level 2** | **48,288** | Market approach and capitalisation. | Market value of similar properties.<br>Dollar rate per m2. | N/A |
| Heritage and cultural[4] | **Level 3** | **4,217** | Depreciated replacement cost approach. | Market value of similar properties.<br>Escalation rate for building cost premium. | N/A |

[1] This is the first year adoption of the Fair Value Measurement requirements and therefore changes in valuation techniques are not required to be disclosed. The above disclosure represents the consolidated financial position of the Group.

[2] Significant unobservable inputs only. Not applicable for assets or liabilities in the Level 2 category. Not applicable for non-financial assets in Level 3 as only one valuation technique has been used.

[3] For investments in unlisted companies where there is no readily available market pricing, the fair value has been determined by applying valuation techniques in line with the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation Guidelines (IPEV)'.

Where recent transactions for the unlisted companies' equity have taken place, these equity transaction prices are used to value CSIRO's investment.

For unlisted companies that have not had any recent equity transactions, other IPEV valuation techniques are used such as discounted cash flows and share of net assets.

Investments in special purpose entities are either valued at cost of share of net realisable assets since a reliable estimate of fair value cannot be established. These entities have been set up primarily to gain access to research facilities/networks, or to provide services to owners. Hence, there is not 'active market' for these equity investments. CSIRO is a long-term shareholder and is unlikely to dispose of its interest in these investments.

[4] Land and Buildings and Heritage and Cultural assets were revalued by CBRE Valuations Pty Ltd (CBRE) as part of CSIRO's asset revaluation for 2013-14.

CBRE adopted escalation rates based upon the Rawlinson Australian Cost Handbook 2014 which is the most widely accepted building costing reference book used by the valuation profession. The handbook is compiled from quantity surveyor advice and provides quarterly cost escalations.

CBRE has adopted an additional 25% above the current modern equivalent construction cost for Heritage and Cultural assets.

[5] Plant and Equipment are classified as Level 3 as they mainly comprise of specialised research equipment.

### 6.3 Reconciliation for recurring Level 3 fair value measurements

There have been no transfers between levels for non-financial assets

**Recurring Level 3 fair value measurements - reconciliation for assets**

| | Non-financial assets | | | |
|---|---|---|---|---|
| | Buildings | Property, plant and equipment | Heritage and Cultural | Total |
| | 2014 | 2014 | 2014 | 2014 |
| | $'000 | $'000 | $'000 | $'000 |
| **Opening balance** | **1,185,230** | **518,426** | **3,263** | **1,706,919** |
| Total gains/(losses) recognised in net cost of services[1] | **(74,121)** | **(53,576)** | **-** | **(127,697)** |
| Transfers | **2,202** | **(6,242)** | **-** | **(4,040)** |
| Purchases | **42,804** | **93,716** | **-** | **136,520** |
| Disposals | **(34)** | **(3,926)** | | **(3,960)** |
| Revaluations | **41,389** | **-** | **954** | **42,343** |
| **Closing balance** | **1,197,470** | **548,398** | **4,217** | **1,750,085** |

[1] These gains/(losses) are presented in the Statement of Comprehensive Income under 'Depreciation and amortisation' and 'Write-down and Impairment of assets'.

There has been one transfer between levels for financial assets.

**Recurring Level 3 fair value measurements - reconciliation for on-financial financial assets**

| | Financial assets | |
|---|---|---|
| | Financial assets | Total |
| | 2014 | 2014 |
| | $'000 | $'000 |
| **Opening balance** | **7,325** | **7,325** |
| Total gains/(losses) recognised in other comprehensive income | **(556)** | **(556)** |
| Transfer to level 1[1] | **(290)** | **(290)** |
| Purchases | **2,700** | **2,700** |
| Disposals | **(201)** | **(201)** |
| **Closing balance** | **8,978** | **8,978** |

[1] The transfer represents a change in the valuation technique adopted to measure the fair value of the shares held by CSIRO in an unlisted company. The shares were previously valued in 2012-13 based on CSIRO's share of net assets. During 2013-14 CSIRO was in negotiations to sell these shares to an existing shareholder and agreement was reached on the sale price before 30 June 2014. The sale transaction occurred in July 2014.

## Note 7: Cash and cash equivalents

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| Cash at bank and on hand | | **29,101** | 48,417 | **25,982** | 45,013 |
| Term deposits | | **369,072** | 356,221 | **269,593** | 238,000 |
| **Total cash and cash equivalents** | | **398,173** | 404,638 | **295,575** | 283,013 |

Total cash includes deposits held on behalf of third parties totalling $4.6 million (2013 $6.3 million). Refer Note 22.

## Note 8: Trade and other receivables

| | | | | |
|---|---|---|---|---|
| **Goods and services receivables in connection with** | | | | |
| Related parties | **11,350** | 12,959 | **12,887** | 12,959 |
| External parties | **48,928** | 69,153 | **48,908** | 69,153 |
| **Total goods and services receivables** | **60,278** | 82,112 | **61,795** | 82,112 |
| | | | | |
| **Other receivables** | | | | |
| Statutory receivables | **4,358** | 3,433 | **3,765** | 2,092 |
| Interest | **1,153** | 3,426 | **410** | 1,988 |
| Other receivables | **6,182** | 82,062 | **2,236** | 84,483 |
| **Total other receivables (gross)** | **11,693** | 88,921 | **6,411** | 88,563 |
| **Total trade and other receivables (gross)** | **71,971** | 171,033 | **68,206** | 170,675 |
| Less impairment allowance for Goods and services | **(644)** | (834) | **(644)** | (834) |
| **Total trade and other receivables (net)** | **71,327** | 170,199 | **67,562** | 169,841 |
| | | | | |
| Trade and other receivables (net) expected to be recovered | | | | |
| No more than 12 months | **71,327** | 170,199 | **67,562** | 169,841 |
| More than 12 months | **-** | - | **-** | - |
| **Total trade and other receivables (net)** | **71,327** | 170,199 | **67,562** | 169,841 |
| | | | | |
| Trade and other receivables (gross) aged as follows | | | | |
| Not overdue | **60,891** | 159,928 | **57,133** | 159,570 |
| Overdue by | | | | |
| 0 to 30 days | **9,589** | 8,181 | **9,582** | 8,181 |
| 31 to 60 days | **997** | 1,216 | **997** | 1,216 |
| 61 to 90 days | **177** | 281 | **177** | 281 |
| More than 90 days | **317** | 1,427 | **317** | 1,427 |
| **Total receivables (gross)** | **71,971** | 171,033 | **68,206** | 170,675 |
| | | | | |
| Impairment allowance aged as follows | | | | |
| Not overdue | **371** | 64 | **371** | 64 |
| Overdue by | | | | |
| 0 to 30 days | **-** | - | **-** | - |
| 31 to 60 days | **6** | 3 | **6** | 3 |
| 61 to 90 days | **-** | 3 | **-** | 3 |
| More than 90 days | **267** | 764 | **267** | 764 |
| **Total impairment allowance** | **644** | 834 | **644** | 834 |

| Reconciliation of impairment allowance: | Consolidated Goods and services | CSIRO Goods and services |
|---|---|---|
| **Movements in relation to 2014** | **$'000** | **$'000** |
| Opening balance | **834** | **834** |
| Decrease recognised in net surplus | **(190)** | **(190)** |
| **Closing balance** | **644** | **644** |
| | | |
| **Movements in relation to 2013** | | |
| Opening balance | 1,527 | 1,527 |
| Increase recognised in net surplus | (693) | (693) |
| **Closing balance** | 834 | 834 |

## Note 9: Investments accounted for using the equity method

| | Consolidated | | CSIRO | |
|---|---|---|---|---|
| | **2014** | 2013 | **2014** | 2013 |
| | **$'000** | $'000 | **$'000** | $'000 |
| **Murray-Darling Fresh Water Research Centre** | **309** | 346 | **309** | 346 |
| Movements of the carrying amount of investment in the MDFRC joint venture entity are as follows: | | | | |
| Carrying amount at beginning of the financial year | **346** | 399 | **346** | 399 |
| Share of MDFRC's net operating surplus/(deficit) for the year | **(37)** | 21 | **(37)** | 21 |
| Adjusted based on audited accounts | **-** | (74) | **-** | (74) |
| Adjusted share of MDFRC's net operating surplus/(deficit) for the year | **(37)** | (53) | **(37)** | (53) |
| **Carrying amount of investment in MDFRC as at 30 June** | **309** | 346 | **309** | 346 |

**Murray-Darling Fresh Water Research Centre (MDFRC)**

The MDFRC is a collaborative joint venture for the purpose of Murray-Darling Basin Freshwater Research to support the generation of knowledge required to ensure the sustainable management of water and associated environmental resources of the Murray-Darling Basin.

CSIRO's 33.3% (2013: 33.3%) investment in MDFRC is accounted for using the equity method. In accordance with the joint venture agreement, the operating surplus/(deficit) was shared by participants in the joint venture. CSIRO's share of the MDFRC's operating deficit was $33,300 (2013: $20,715 surplus).

The following is a summary of the financial performance and position of MDFRC:

| | Total Revenues | Net Operating Deficit | Total Assets | Total Liabilities | Net Assets |
|---|---|---|---|---|---|
| | **$'000** | **$'000** | **$'000** | **$'000** | **$'000** |
| **2014** | | | | | |
| MDFRC (unaudited) | **5,966** | **(110)** | **3,445** | **2,516** | **929** |
| | | | | | |
| **2013** | | | | | |
| MDFRC (audited)[1] | 5,442 | 62 | 3,696 | 2,657 | 1,039 |

No indicators of impairment were found for investments accounted for using the equity method.

No investments accounted for using the equity method are expected to be sold within the next 12 months.

[1] The 2013 balances have been updated to reflect final audited results.

## Note 10: Other investments

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| At fair value classified as available for sale investments. | 1.14 | | | | |
| **Shares (or equity investments)** | | | | | |
| Listed companies | | **4,280** | 3,195 | **4,280** | 3,195 |
| Unlisted companies | | **10,341** | 7,325 | **10,341** | 7,325 |
| **Total investments** | | **14,621** | 10,520 | **14,621** | 10,520 |

All other investments are expected to be recovered in more than 12 months.
Available for sale investments were impaired by $0.4 million (2013: $6.2 million).

## Note 11: Land and buildings

| | Consolidated | | CSIRO | |
|---|---|---|---|---|
| | **2014** | 2013 | **2014** | 2013 |
| | **$'000** | $'000 | **$'000** | $'000 |
| **Freehold land - fair value** | **365,868** | 378,593 | **365,868** | 378,593 |
| **Buildings on freehold land** | | | | |
| - fair value | **1,811,630** | 1,712,854 | **1,811,630** | 1,712,854 |
| - accumulated depreciation | **(1,081,049)** | (976,393) | **(1,081,049)** | (976,393) |
| | **730,581** | 736,461 | **730,581** | 736,461 |
| - work in progress | **51,837** | 18,083 | **51,837** | 18,083 |
| **Total buildings on freehold land** | **782,418** | 754,544 | **782,418** | 754,544 |
| **Leasehold improvements** | | | | |
| - fair value | **433,631** | 385,035 | **433,631** | 385,035 |
| - accumulated depreciation | **(140,963)** | (123,398) | **(140,963)** | (123,398) |
| | **292,668** | 261,637 | **292,668** | 261,637 |
| - work in progress | **6,165** | 50,589 | **6,165** | 50,589 |
| **Total leasehold improvements** | **298,833** | 312,226 | **298,833** | 312,226 |
| **Buildings under finance lease** | | | | |
| - fair value | **196,099** | 188,689 | **196,099** | 188,689 |
| - accumulated depreciation | **(79,880)** | (70,229) | **(79,880)** | (70,229) |
| **Total buildings under finance lease** | **116,219** | 118,460 | **116,219** | 118,460 |
| **Total land and buildings** | **1,563,338** | 1,563,823 | **1,563,338** | 1,563,823 |

All revaluations are conducted in accordance with the revaluation policy stated in Note 1.17. Land and buildings were revalued as at 30 June 2014 by independent valuers. The valuer was CB Richard Ellis.
No indicators of impairment were identified for land and buildings.

## Note 12: Plant and equipment

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **Plant and equipment** | | | | | |
| - fair value | | **856,422** | 789,068 | **856,415** | 789,068 |
| - accumulated depreciation | | **(511,259)** | (490,406) | **(511,258)** | (490,406) |
| | | **345,163** | 298,662 | **345,157** | 298,662 |
| - work in progress | | **100,799** | 119,572 | **100,799** | 119,572 |
| **Total plant and equipment** | | **445,962** | 418,234 | **445,956** | 418,234 |
| **Research vessel** | | | | | |
| - fair value | | **1,062** | 80,339 | **1,062** | 80,339 |
| - accumulated depreciation | | **(694)** | (76,194) | **(694)** | (76,194) |
| | | **368** | 4,145 | **368** | 4,145 |
| - work in progress | | **102,068** | 96,047 | **102,068** | 96,047 |
| **Total research vessel** | | **102,436** | 100,192 | **102,436** | 100,192 |
| **Total plant and equipment** | | **548,398** | 518,426 | **548,392** | 518,426 |

All revaluations are conducted in accordance with the revaluation policy stated in Note 1.17. Plant and equipment were revalued as at 30 June 2012 by a panel of independent valuers. The primary valuer was the Australian Valuation Office.

No indicators of impairment were identified for plant and equipment.

## Note 13: Heritage and cultural

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **Heritage and Cultural** | | | | | |
| Buildings | | | | | |
| - fair value | | **4,217** | 3,263 | **4,217** | 3,263 |
| **Total heritage and cultural** | | **4,217** | 3,263 | **4,217** | 3,263 |

Heritage buildings have been separately disclosed for the first time in 2014. Heritage buildings were subject to a desktop valuation review as at 30 June 2014.

## Note 14: Intangibles

| | | | | | |
|---|---|---|---|---|---|
| **Intangibles** | 1.18 | | | | |
| Internally developed – in use | | **54,369** | 42,917 | **54,369** | 42,917 |
| Internally developed – in progress | | **270** | 574 | **270** | 574 |
| | | **54,639** | 43,491 | **54,639** | 43,491 |
| Accumulated amortisation | | **(23,266)** | (18,356) | **(23,266)** | (18,356) |
| **Total intangibles** | | **31,373** | 25,135 | **31,373** | 25,135 |

No indicators of impairment were identified for intangible assets.

## Continued from Notes 11 – 14 Land, buildings, plant and equipment and intangibles

**(a) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles (2013-14) - Consolidated**

| | Land | Buildings | Total land and buildings | Plant and equipment | Heritage and Cultural | Intangibles | Total |
|---|---|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 |
| **As at 1 July 2013** | | | | | | | |
| Gross book value | 378,593 | 2,355,250 | 2,733,843 | 1,085,026 | 9,062 | 43,491 | 3,871,422 |
| Accumulated depreciation and impairment | - | (1,170,020) | (1,170,020) | (566,600) | (5,799) | (18,356) | (1,760,775) |
| **Net book value as at 1 July 2013** | 378,593 | 1,185,230 | 1,563,823 | 518,426 | 3,263 | 25,135 | 2,110,647 |
| Additions: | | | | | | | |
| By purchase | 4,338 | 42,804 | 47,142 | 93,716 | - | 7,093 | 147,951 |
| Reclassification | (511) | 2,202 | 1,691 | (6,242) | - | 4,725 | 174 |
| Revaluations and impairments recognised in other comprehensive income | (16,552) | 41,389 | 24,837 | - | 954 | - | 25,791 |
| Revaluations and impairments recognised in net cost of services | - | (103) | (103) | - | - | - | (103) |
| Depreciation expense | - | (74,018) | (74,018) | (53,576) | - | (5,580) | (133,174) |
| Disposals | - | (34) | (34) | (3,926) | - | - | (3,960) |
| Other (adjustment to prior period) | - | - | - | - | - | - | - |
| **Net book value as at 30 June 2014** | 365,868 | 1,197,470 | 1,563,338 | 548,398 | 4,217 | 31,373 | 2,147,326 |
| **Net book value as at 30 June 2014 represented by:** | | | | | | | |
| Gross book value | 365,868 | 2,499,362 | 2,865,230 | 1,060,351 | 11,713 | 54,639 | 3,991,933 |
| Accumulated depreciation and impairment | - | (1,301,892) | (1,301,892) | (511,953) | (7,496) | (23,266) | (1,844,607) |
| | 365,868 | 1,197,470 | 1,563,338 | 548,398 | 4,217 | 31,373 | 2,147,326 |

**(a) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles (2012-13) - Consolidated and CSIRO[1]**

| | Land | Buildings | Total land and buildings | Plant and equipment | Heritage and Cultural | Intangibles | Total |
|---|---|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 |
| **As at 1 July 2012** | | | | | | | |
| Gross book value | 378,593 | 2,299,342 | 2,677,935 | 985,605 | 9,062 | 42,959 | 3,715,561 |
| Accumulated depreciation and impairment | - | (1,099,453) | (1,099,453) | (538,754) | (5,799) | (14,248) | (1,658,254) |
| **Net book value as at 1 July 2012** | 378,593 | 1,199,889 | 1,578,482 | 446,851 | 3,263 | 28,711 | 2,057,307 |
| Additions: | | | | | | | |
| By purchase | - | 55,598 | 55,598 | 121,645 | - | 537 | 177,780 |
| Reclassification | - | 84 | 84 | (84) | - | - | - |
| Revaluation and impairments | - | - | - | (1,102) | - | - | (1,102) |
| Depreciation expense | - | (71,225) | (71,225) | (47,568) | - | (4,113) | (122,906) |
| Disposals | - | (77) | (77) | (1,316) | - | - | (1,393) |
| Other (adjustment to prior period) | | 961 | 961 | | | | 961 |
| **Net book value as at 30 June 2013** | 378,593 | 1,185,230 | 1,563,823 | 518,426 | 3,263 | 25,135 | 2,110,647 |
| **Net book value as at 30 June 2013 represented by:** | | | | | | | |
| Gross book value | 378,593 | 2,355,250 | 2,733,843 | 1,085,026 | 9,062 | 43,491 | 3,871,422 |
| Accumulated depreciation and impairment | - | (1,170,020) | (1,170,020) | (566,600) | (5,799) | (18,356) | (1,760,775) |
| | 378,593 | 1,185,230 | 1,563,823 | 518,426 | 3,263 | 25,135 | 2,110,647 |

[1] Note – for 2012-13 CSIRO and Consolidated balances were identical.

**(a) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles (2013-14) - CSIRO**

| | Land | Buildings | Total land and buildings | Plant and equipment | Heritage and Cultural | Intangibles | Total |
|---|---|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 |
| **As at 1 July 2013** | | | | | | | |
| Gross book value | 378,593 | 2,355,250 | 2,733,843 | 1,085,026 | 9,062 | 43,491 | 3,871,422 |
| Accumulated depreciation and impairment | - | (1,170,020) | (1,170,020) | (566,600) | (5,799) | (18,356) | (1,760,775) |
| **Net book value as at 1 July 2013** | 378,593 | 1,185,230 | 1,563,823 | 518,426 | 3,263 | 25,135 | 2,110,647 |
| Additions: | | | | | | | |
| By purchase | 4,338 | 42,804 | 47,142 | 93,709 | - | 7,093 | 147,944 |
| Reclassification | (511) | 2,202 | 1,691 | (6,242) | - | 4,725 | 174 |
| Revaluations and impairments recognised in other comprehensive income | (16,552) | 41,389 | 24,837 | - | 954 | - | 25,791 |
| Revaluations and impairments recognised in net cost of services | - | (103) | (103) | - | - | - | (103) |
| Depreciation expense | - | (74,018) | (74,018) | (53,575) | - | (5,580) | (133,173) |
| Disposals | - | (34) | (34) | (3,926) | - | - | (3,960) |
| Other (adjustment to prior period) | - | - | - | - | - | - | - |
| **Net book value as at 30 June 2014** | 365,868 | 1,197,470 | 1,563,338 | 548,392 | 4,217 | 31,373 | 2,147,320 |
| **Net book value as at 30 June 2014 represented by:** | | | | | | | |
| Gross book value | 365,868 | 2,499,362 | 2,865,230 | 1,060,344 | 11,713 | 54,639 | 3,991,926 |
| Accumulated depreciation and impairment | - | (1,301,892) | (1,301,892) | (511,952) | (7,496) | (23,266) | (1,844,606) |
| | 365,868 | 1,197,470 | 1,563,338 | 548,392 | 4,217 | 31,373 | 2,147,320 |

## Note 15: Investment properties

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **Investment properties - fair value** | 1.19 | **48,288** | 52,150 | **48,288** | 52,150 |
| **Reconciliation of the opening and closing balances of investment properties** | | | | | |
| **As at 1 July** | | **52,150** | 52,000 | **52,150** | 52,000 |
| Net gain/(loss) from fair value adjustments | | **(3,862)** | 150 | **(3,862)** | 150 |
| **Net book value as at 30 June** | | **48,288** | 52,150 | **48,288** | 52,150 |

As at 30 June 2014 investment properties comprise properties that are leased to third parties. The leases contain an initial non-cancellable period of ten years. Rental income from investment properties was $3.7 million (2013: $3.5 million). Fair value loss on investment properties for the year was $3.9 million (2013: gain of $0.15 million).

All revaluations are conducted in accordance with the revaluation policy stated in Note 1.17. Investment Properties were revalued as at 30 June 2014 by an independent valuer. The valuer was the Australian Valuation Office.

No indicators of impairment were identified for investment properties.

## Note 16: Inventories held for sale

| | | | | | |
|---|---|---|---|---|---|
| **Books and media products - at lower cost and net realisable value** | 1.20 | **1,180** | 1,162 | **1,180** | 1,162 |

No items of inventory were recognised at fair value less cost to sell.
All inventory is expected to be sold in the next 12 months.

## Note 17: Other non-financial assets

| | | | | | |
|---|---|---|---|---|---|
| Contract research work in progress - at cost | 1.6 | **36,686** | 46,250 | **36,686** | 46,250 |
| Capital prepayments | | **48,564** | - | **48,564** | - |
| Other prepayments | | **8,176** | 6,857 | **8,132** | 6,857 |
| **Total other non-financial assets** | | **93,426** | 53,107 | **93,382** | 53,107 |

No indicators of impairment were identified for other non-financial assets.

All other non-financial assets are expected to be recovered in no more than 12 months.

## Note 18: Properties held for sale

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **Properties held for sale** | 1.29 | **9,091** | 8,583 | **9,091** | 8,583 |
| **Reconciliation of the opening and closing balances of properties held for sale** | | | | | |
| **As at 1 July** | | **8,583** | 14,319 | **8,583** | 14,319 |
| Reclassification | | **(174)** | - | **(174)** | - |
| Disposals | | **-** | (4,936) | **-** | (4,936) |
| Gain/(loss) on revaluation | | **682** | (800) | **682** | (800) |
| **Net book value as at 30 June** | | **9,091** | 8,583 | **9,091** | 8,583 |

Balance as at 30 June 2014 represents properties identified as surplus to CSIRO's needs and classified as 'held for sale'. They are expected to be settled within the next 12 months.

## Note 19: Suppliers

| | | | | | |
|---|---|---|---|---|---|
| **Trade creditors and accruals** | | **54,773** | 62,433 | **54,347** | 61,779 |
| Suppliers payable expected to be settled within 12 months. | | | | | |
| Related parties | | **1,193** | 1,126 | **1,193** | 1,126 |
| External parties | | **53,580** | 61,307 | **53,154** | 60,653 |
| **Total** | | **54,773** | 62,433 | **54,347** | 61,779 |

Settlement is usually made within 30 days.

## Note 20: Other payables

| | | | | | |
|---|---|---|---|---|---|
| Accrued salaries and wages | | **23,071** | 22,582 | **22,699** | 21,413 |
| Contract research revenue received in advance | 1.6 | **96,791** | 93,193 | **97,691** | 93,193 |
| Other revenue received in advance | | **10,559** | 16,046 | **10,559** | 16,046 |
| Other creditors and accrued expenses | | **22,780** | 21,351 | **19,100** | 22,111 |
| Payment to the Commonwealth | | **27,896** | 28,290 | **27,896** | 28,290 |
| **Total other payables** | | **181,097** | 181,462 | **177,945** | 181,053 |

All other payables are expected to be settled within 12 months.

## Note 21: Finance Leases

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| Finance leases | | **53,475** | 57,243 | **53,475** | 57,243 |
| **Total finance leases** | | **53,475** | 57,243 | **53,475** | 57,243 |
| Payable | | | | | |
| Within one year | | | | | |
| Minimum lease payments | | **8,400** | 7,612 | **8,400** | 7,612 |
| Deduct: future finance charges | | **(2,471)** | (2,647) | **(2,471)** | (2,647) |
| **Total payable within one year (current)** | | **5,929** | 4,965 | **5,929** | 4,965 |
| In one to five years | | | | | |
| Minimum lease payments | | **25,020** | 26,517 | **25,020** | 26,517 |
| Deduct: future finance charges | | **(7,541)** | (8,382) | **(7,541)** | (8,382) |
| **Total payable within one to five years** | | **17,479** | 18,135 | **17,479** | 18,135 |
| In more than five years | | | | | |
| Minimum lease payments | | **33,909** | 39,549 | **33,909** | 39,549 |
| Deduct: future finance charges | | **(3,842)** | (5,406) | **(3,842)** | (5,406) |
| **Total payable in more than five years** | | **30,067** | 34,143 | **30,067** | 34,143 |
| **Total finance leases recognised on the statement of financial position** | | **53,475** | 57,243 | **53,475** | 57,243 |

Finance leases exist in relation to certain buildings and major equipment assets. The leases are non-cancellable and for fixed terms ranging from 2 to 25 years. CSIRO guarantees the residual values of all assets leased. There are no contingent rentals. The interest rate implicit in the leases averaged 5% per annum (2013: 5% per annum). The lease liabilities are secured by the lease assets.

## Note 22: Deposits

| | Consolidated | | CSIRO | |
|---|---|---|---|---|
| | **2014** | 2013 | **2014** | 2013 |
| | **$'000** | $'000 | **$'000** | $'000 |
| **Deposits** | **4,567** | 6,337 | **4,567** | 6,337 |
| Deposits represent monies held on behalf of the following third parties: | | | | |
| Goyder Institute of Water Research | **3,455** | 5,000 | **3,455** | 5,000 |
| Others | **1,112** | 1,337 | **1,112** | 1,337 |
| **Total deposits** | **4,567** | 6,337 | **4,567** | 6,337 |

All deposits are expected to be settled within the next 12 months.

## Note 23: Employee provisions

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| Annual leave | | **61,257** | 66,493 | **61,257** | 66,493 |
| Long service leave | | **141,128** | 174,536 | **141,128** | 174,536 |
| Severance pay | | **6,913** | 7,024 | **6,913** | 7,024 |
| Redundancies | | **50,040** | 18,885 | **50,040** | 18,885 |
| **Total employee provisions** | | **259,338** | 266,938 | **259,338** | 266,938 |
| Employee provisions are expected to be settled in | | | | | |
| No more than 12 months | | **89,931** | 63,338 | **89,931** | 63,338 |
| More than 12 months | | **169,407** | 203,600 | **169,407** | 203,600 |
| **Total employee provisions** | | **259,338** | 266,938 | **259,338** | 266,938 |

## Note 24: Cash flow reconciliation

| | | | | | |
|---|---|---|---|---|---|
| **Reconciliation of cash and cash equivalents as per statement of financial position to cash flow statement** | | | | | |
| Cash and cash equivalents as per | | | | | |
| Cash Flow Statement | | **398,173** | 404,638 | **295,575** | 283,013 |
| Statement of financial position | 7 | **398,173** | 404,638 | **295,575** | 283,013 |
| **Discrepancy** | | **-** | - | **-** | - |
| **Reconciliation of net cost of services to net cash from operating activities** | | | | | |
| Net cost of services | | **(821,943)** | (774,903) | **(803,858)** | (755,302) |
| Revenue from Government | | **778,177** | 733,817 | **778,177** | 733,817 |
| Share of net operating surplus/(deficit) of joint venture accounted for using the equity method | | **(37)** | (53) | **(37)** | (53) |
| **Adjustments for non-cash items** | | | | | |
| Depreciation and amortisation | | **133,174** | 122,906 | **133,173** | 122,906 |
| Net write-down and impairment of assets | | **3,673** | 7,157 | **3,673** | 7,157 |
| (Gains)/loss from sale of property, plant and equipment | | **2,355** | 874 | **2,355** | 874 |
| (Gains)/loss from sale of equity investments and intellectual property | | **14** | - | **14** | - |
| Other revenue not providing cash | | **37** | (2,961) | **37** | (2,961) |
| **Movements in assets and liabilities** | | | | | |
| **Assets** | | | | | |
| (Increase)/decrease in trade and other receivables | | **99,797** | 77,685 | **103,952** | 77,851 |
| (Increase)/decrease in inventories | | **(18)** | 1 | **(18)** | 1 |
| (Increase)/decrease in other non-financial assets | | **(40,319)** | (11,011) | **(40,275)** | (11,013) |
| (Increase)/decrease in other financial asset | | **-** | 353 | **-** | 353 |
| (Increase)/decrease in GST receivable | | **(925)** | (576) | **(1,673)** | (576) |
| **Liabilities** | | | | | |
| Increase/(decrease) in employee liabilities | | **(7,600)** | 14,248 | **(7,600)** | 14,248 |
| Increase/(decrease) in supplier payables | | **(7,582)** | (13,389) | **(7,433)** | (12,449) |
| Increase/(decrease) in other payables | | **29** | (12,057) | **(2,714)** | (13,796) |
| Increase/(decrease) in deposits-liabilities | | **(1,770)** | (793) | **(1,770)** | (793) |
| **Net cash from operating activities** | | **137,062** | 141,298 | **156,003** | 160,264 |

## Note 25: Contingent assets and liabilities

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **Quantifiable Contingencies** | | | | | |
| **Contingent assets** | | | | | |
| Anticipated net insurance claims[1] | | **-** | 931 | **-** | 931 |
| **Total contingent assets** | | **-** | 931 | **-** | 931 |
| **Contingent liabilities** | | | | | |
| Estimate Legal Claims[2] | | **(400)** | (400) | **(400)** | (400) |
| Financial guarantee for a bank loan | | **(294)** | - | **(294)** | - |
| Financial guarantee for an export agreement. | | **-** | (45) | **-** | (45) |
| **Total contingent liabilities** | | **(694)** | (445) | **(694)** | (445) |
| **Total net contingent asset/(liability)** | | **(694)** | 486 | **(694)** | 486 |

Depending on the materiality of risks involved with certain commercial transactions, CSIRO has requested bank guarantees where necessary to mitigate such risks, notably where substantial advance payments were made. At 30 June 2014 CSIRO was the beneficiary of bank guarantees adding to a total value of $72.8 million.

[1] Under a number of commercial agreements, the Group has receivable assets, to be received at a future date upon the conditions of the agreements being met. At this stage, it is too early to determine whether the conditions of the agreements will be met and predict when the amounts will be received.

[2] Estimated legal claims arising from employment, motor vehicle accidents, commercial and patent disputes. The Group has denied liability and is defending the claims. The estimate is based on precedent in such cases.

**Unquantifiable contingencies**

CSIRO is currently involved in several legal proceedings related to a family of wireless local area network (WLAN) patents which it owns and has licensed broadly. The proceedings are additional to similar proceedings settled by CSIRO in 2009 and 2012. Two actions in the USA involve claims and counterclaims related to patent damages, infringement, patent validity, and related matters. The first of those cases to proceed to trial was heard in February 2014. A damages award of USD $16 million plus interest was made (this decision may still be appealed). A trial is set for July 2015 in the other of those two US cases. In August 2013 a further proceeding was filed in Germany seeking damages for patent infringement. At this stage, the final revenue and costs of all these action are considered unquantifiable.

## Note 26: Cooperative Research Centres (CRCs)

All CRCs have been classified as joint operations as the purpose is for the pursuit of collaborative scientific research where participants share in the scientific outcomes and outputs of the CRCs. In the event that CRC research results in a move to commercialisation, a separate legal entity is established and CSIRO's share of the new entity is treated either as subsidiary, joint venture or associate in the Statement of Financial Position as appropriate.

CSIRO's total cash and in-kind contribution (e.g. staff and use of assets) to CRCs from its own resources was $11.5 million for the year (2013: $13.6 million). Contributions made by CSIRO are expensed as incurred and these are included in the Statement of Comprehensive Income.

No contingent liabilities were reported by the CRC's in which CSIRO is a participant.

CSIRO is a participant in the following CRCs as at 30 June 2014.

| **Name of CRC** | **Expected Termination date** |
|---|---|
| Antarctic Climate and Ecosystems CRC | 30/06/16 |
| Australian Poultry CRC | 30/06/16 |
| Australian Seafood CRC | 30/06/15 |
| Australasian Invasive Animals CRC | 30/06/18 |
| Automotive Australia 2020 CRC | 30/06/17 |
| Bushfire CRC | 30/06/16 |
| CRC for Cancer Therapeutics | 30/06/20 |
| CRC for Contaminated Assessment and Remediation of the Environment (CRC for CARE) | 30/06/20 |
| CRC for Low Carbon Living | 30/06/19 |
| CRC for Mental Health | 30/06/18 |
| CRC for Polymers | 30/06/17 |
| Deep Exploration Technologies CRC | 30/06/16 |
| Greenhouse Gas Technologies CRC | 30/06/16 |
| National Plant Biosecurity CRC | 30/06/17 |
| Pork CRC | 30/06/19 |
| Remote Economic Participation CRC | 30/06/17 |
| Vision CRC | 30/06/17 |

| | |
|---|---|
| The following CRC's have terminated and/or CSIRO's participation concluded at 30 June 2014. | |
| Advanced Manufacturing CRC | 30/06/14 |
| Sheep Industry Innovation CRC | 30/06/14 |
| Future Farm Industries CRC | 30/06/14 |

## Note 27: Resources made available to the Group and not included in the Statement of Financial Position

| | Land | Buildings | Plant and Equipment | Total |
|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 |
| At cost or fair value | 3,425 | 755 | 33,012 | 37,192 |
| Accumulated depreciation | - | - | (21,373) | (21,373) |
| **Net value as at 30 June 2014** | **3,425** | **755** | **11,639** | **15,819** |
| **Net value as at 30 June 2013** | **4,615** | **153** | **12,366** | **17,134** |

The above assets are made available to CSIRO at little or no cost in accordance with formal agreements with contributors. They have either been purchased out of contract research monies and expensed in the year of purchase, in accordance with accounting policy Note 1.7, or made available to CSIRO at little or no cost. The assets include vehicles, computers and scientific equipment and land and buildings.

These assets are controlled and accounted for in the contributors' books and any proceeds from their disposals are refundable to the contributors in accordance with formal agreements on equity share. There are some restrictions on how these assets are operated.

## Note 28: Monies held in trust

| | 2014 | 2013 |
|---|---|---|
| | $'000 | $'000 |
| Monies held in trust represented by cash, deposits and investments for the benefit of the Group which are not included in the Statement of Financial Position are: | | |
| The Sir Ian McLennan Achievement for Industry Award - established to award outstanding contributions by the Group's scientists and engineers to national development. | **336** | 301 |
| The Elwood and Hannah Zimmerman Trust Fund - established to fund weevil research and the curation of the Australian National Insect Collection (ANIC) weevil collection. | **5,184** | 4,999 |
| The Schlinger Trust - established to research the taxonomy, biosystematics, general biology and biogeography of Australasian Diptera conducted by the Australian National Insect Collection. | **2,504** | 2,420 |
| **Total monies held in trust as at 30 June** | **8,024** | 7,720 |

Movement summary of monies held in trust:

| | McLennan | Zimmerman | Schlinger | Total |
|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 |
| Balance as at 1 July 2013 | 301 | 4,999 | 2,420 | 7,720 |
| Interest and distribution | 35 | 491 | 101 | 627 |
| Expenditure | - | (306) | (16) | (322) |
| **Balance as at 30 June 2014** | **336** | **5,184** | **2,504** | **8,024** |

## Note 29: Collections

CSIRO has a number of collections used for scientific research. These collections have been established over time and cover an extensive range of evolution and change in species. The collections are irreplaceable, bear scientific and historical value and are not reliably measurable in monetary terms. Therefore, CSIRO has not recognised them as an asset in its financial statements.

The main collections held by CSIRO are:

- Australian National Herbarium (ANH) – The ANH is one of the largest plant collections in Australia with approximately one million preserved plant specimens. It is unique among the Australian Herbaria in having a national focus for its collections, acquisition and research programs.
- Australian National Insect Collection (ANIC) – The ANIC has over 12 million specimens and is the largest research collection of Australian insects and related organisms in the world.
- Australian National Wildlife Collection (ANWC) – The ANWC, with over 80,000 specimens, holds land vertebrate collections, including the most comprehensively documented collections of Australian-New Guinean birds in the world.
- CSIRO National Fish Collection (ANFC) – The ANFC houses more than 145,000 finfish specimens representing more than 3000 species. These include Australian, Antarctica, and Indo-Pacific oceanic, inshore, estuarine and river fishes. The collection is internationally recognised for its Indo-Pacific sharks and rays and temperate and Southern Ocean species. It acts as a focal point for national and international collaboration.
- The Australian Tree Seed Collection (ATSC) – For over 40 years ATSC has been collecting, researching and supplying quality, fully documented tree seed to both domestic and overseas customers. Collections of seed are sourced from wild populations and genetically improved seed from our domestication and improvement programs.

Other collections include, but are not limited to, Australian National Algae Culture Collection (CSIRO collection of living microalgae), the Dadswell Memorial Wood Collection, the Wood-Inhabiting Fungi Collection and the Tropical Herbarium.

## Note 30: Auditor's remuneration[1]

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$** | $ | **$** | $ |
| Amounts received or due and receivable by the Group's auditors for: | | | | | |
| An audit of the financial statements of CSIRO and the consolidated entity | | **238,800** | 234,900 | **226,000** | 223,000 |
| Other non-audit related[2] | | **103,638** | 156,601 | **103,638** | 156,601 |
| | | **342,438** | **391,501** | **329,638** | **379,601** |

[1] CSIRO's auditor is the Australian National Audit Office who has retained KPMG to assist with the assignment.
[2] These services are performed by KPMG directly and include taxation, governance services and financial reporting software.

## Note 31: Remuneration of Board Members

| | | | | |
|---|---|---|---|---|
| Remuneration and superannuation benefits received or due and receivable by full-time and part-time Board Members, excluding the Chief Executive Officer were: | | | | |
| Board Members' remuneration | **544,420** | 495,003 | **544,420** | 495,003 |
| Payments to superannuation funds for Board Members | **45,714** | 44,212 | **45,714** | 44,212 |
| **Total remuneration** | **590,134** | 539,215 | **590,134** | 539,215 |

The remuneration of the Chief Executive Officer, who is also a Board Member of the Group is reported under Note 32 Senior Executive Remuneration.

The number of Board Members whose total remuneration fell within the following bands were:

| **$** | **Number** | **Number** | **Number** | **Number** |
|---|---|---|---|---|
| 0 - 29,999 | **1** | 2 | **1** | 2 |
| 30,000 - 59,999 | **-** | 4 | **-** | 4 |
| 60,000 - 89,999 | **7** | 3 | **7** | 3 |
| 90,000 - 119,999 | **1** | 1 | **1** | 1 |
| **Total** | **9** | 10 | **9** | 10 |

## Note 32: Senior Executive Remuneration

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$** | $ | **$** | $ |
| **Note 32 Senior Executive Remuneration** | | | | | |
| **(a) Senior Executive remuneration expense for the reporting period**[1&2] | | | | | |
| **Short-term employee benefits** | | | | | |
| Salary | | **7,496,582** | 6,742,392 | **7,496,582** | 6,742,392 |
| Performance bonuses | | **2,246,174** | 1,637,312 | **2,246,174** | 1,637,312 |
| Additional allowances | | **437,870** | 501,240 | **437,870** | 501,240 |
| **Total short-term employee benefits** | | **10,180,626** | 8,880,944 | **10,180,626** | 8,880,944 |
| **Post-employment benefits** | | | | | |
| Superannuation | | **1,134,618** | 1,055,365 | **1,134,618** | 1,055,365 |
| **Total post-employment benefits** | | **1,134,618** | 1,055,365 | **1,134,618** | 1,055,365 |
| **Other long-term benefits** | | | | | |
| Annual leave accrued | | **558,516** | 738,377 | **558,516** | 738,377 |
| Long-service leave accrued [3] | | **303,436** | 769,936 | **303,436** | 769,936 |
| **Total other long-term benefits** | | **861,952** | 1,508,313 | **861,952** | 1,508,313 |
| **Termination benefits** | | | | | |
| Termination benefits | | **-** | - | **-** | - |
| **Total termination benefits** | | **-** | - | **-** | - |
| **Total** | | **12,177,196** | 11,444,622 | **12,177,196** | 11,444,622 |

***Notes:***

[1] Note 32 (a) is prepared on an accrual basis (therefore the performance bonus expenses disclosed above may differ from the cash 'bonus paid' in Note 32 (b)).

[2] Note 32 (a) excludes acting arrangements and part-year service where total remuneration expenses for a senior executive was less than $195,000.

[3] The movement in long service leave includes the impact of the reduced discounting factor for employee provisions as at 30 June 2014.

**Note 32 (b) Average annual reportable remuneration paid to substantive senior executives during the reporting period - Consolidated**

| | 2014 | | | | | |
|---|---|---|---|---|---|---|
| **Average annual reportable remuneration[1]** | **Substantive Senior Executives No.** | **Reportable salary[2&6] $** | **Contributed superannuation[3] $** | **Reportable allowances[4] $** | **Bonus paid[5] $** | **Total $** |
| Total remuneration (including part-time arrangements): | | | | | | |
| less than $195,000 | 3 | 114,645 | 15,651 | - | 3,174 | 133,470 |
| $225,000 to $254,999 | 4 | 179,893 | 26,289 | - | 36,928 | 243,110 |
| $255,000 to $284,999 | 4 | 222,890 | 31,108 | - | 16,518 | 270,516 |
| $285,000 to $314,999 | 6 | 219,221 | 32,117 | - | 44,838 | 296,176 |
| $315,000 to $344,999 | 5 | 233,876 | 34,674 | - | 64,776 | 333,326 |
| $345,000 to $374,999 | 4 | 285,092 | 24,531 | - | 53,036 | 362,659 |
| $375,000 to $404,999 | 1 | 297,799 | 38,313 | - | 51,305 | 387,417 |
| $405,000 to $434,999 | 1 | 313,711 | 47,156 | - | 71,845 | 432,712 |
| $435,000 to $464,999 | 1 | 305,485 | 52,010 | - | 80,970 | 438,465 |
| $465,000 to $494,999 | 1 | 336,570 | 29,075 | - | 119,989 | 485,634 |
| $525,000 to $554,999 | 2 | 387,952 | 56,283 | - | 89,919 | 534,154 |
| $555,000 to $584,999 | 1 | 403,437 | 36,965 | - | 124,942 | 565,344 |
| $795,000 to $824,999 | 1 | 584,241 | 71,130 | - | 167,038 | 822,409 |
| **Total** | 34 | | | | | |

**Note 32 (b) Average annual reportable remuneration paid to substantive senior executives during the reporting period - Consolidated**

| | 2013 | | | | | |
|---|---|---|---|---|---|---|
| **Average annual reportable remuneration**[1] | Substantive Senior Executives No. | Reportable salary[2&6] $ | Contributed superannuation[3] $ | Reportable allowances[4] $ | Bonus paid[5] $ | Total $ |
| Total remuneration (including part-time arrangements): | | | | | | |
| less than $195,000 | 10 | 68,787 | 10,092 | - | 9,356 | 88,235 |
| $195,000 to $224,999 | 2 | 160,833 | 21,164 | - | 37,547 | 219,544 |
| $225,000 to $254,999 | 2 | 205,235 | 29,501 | - | - | 234,736 |
| $255,000 to $284,999 | 4 | 193,806 | 28,615 | - | 47,492 | 269,913 |
| $285,000 to $314,999 | 6 | 213,912 | 27,355 | - | 52,522 | 293,789 |
| $315,000 to $344,999 | 4 | 233,720 | 33,340 | - | 56,008 | 323,068 |
| $345,000 to $374,999 | 2 | 282,243 | 23,807 | - | 47,466 | 353,516 |
| $375,000 to $404,999 | 1 | 278,846 | 39,548 | - | 62,571 | 380,965 |
| $405,000 to $434,999 | 4 | 298,819 | 46,819 | - | 73,769 | 419,407 |
| $435,000 to $464,999 | 1 | 300,876 | 54,014 | - | 89,062 | 443,952 |
| $495,000 to $524,999 | 1 | 362,689 | 51,689 | - | 83,832 | 498,210 |
| $765,000 to $794,999 | 1 | 566,329 | 66,336 | - | 157,550 | 790,215 |
| **Total** | **38** | | | | | |

***Notes:***

[1] This table reports substantive senior executives who received remuneration during the reporting period. Each row is an averaged figure based on headcount for individuals in the band.

[2] 'Reportable salary' includes the following: a) gross payments (less any bonuses paid, which are separated out and disclosed in the 'bonus paid' column); b) reportable fringe benefits (at the net amount prior to 'grossing up' to account for tax benefits); c) exempt foreign employment income; d) salary sacrificed benefits; e) termination benefits paid in 2013-14 where applicable.

[3] The 'contributed superannuation' amount is the average cost to the entity for the provision of superannuation benefits to substantive senior executives in that reportable remuneration band during the reporting period.

[4] 'Reportable allowances' are the average actual allowances paid as per the 'total allowances' line on individuals' payment summaries.

[5] 'Bonus paid' represents average actual bonuses paid during the reporting period in that reportable remuneration band. The 'bonus paid' within a particular band may vary between financial years due to various factors such as individuals commencing with or leaving the entity during the financial year.

[6] Various salary sacrifice benefits are reported in the 'reportable salary' column, including salary sacrificed superannuation.

**Note 32 (c) Average annual reportable remuneration paid to other highly paid staff during the reporting period - Consolidated**

| | | 2014 | | | | |
|---|---|---|---|---|---|---|
| Average annual reportable remuneration[1] | Highly paid staff No. | Reportable salary[2&6] $ | Contributed superannuation[3] $ | Reportable allowances[4] $ | Bonus paid[5] $ | Total $ |
| **Total reportable remuneration (including part time arrangements)** | | | | | | |
| $195,000 to $224,999 | 149 | 175,954 | 27,568 | - | 4,740 | 208,262 |
| $225,000 to $254,999 | 71 | 197,960 | 30,655 | - | 8,596 | 237,211 |
| $255,000 to $284,999 | 23 | 210,203 | 30,455 | - | 23,176 | 263,834 |
| $285,000 to $314,999 | 6 | 233,222 | 33,546 | - | 31,154 | 297,922 |
| $345,000 to $374,999 | 3 | 260,995 | 38,586 | - | 53,544 | 353,125 |
| $405,000 to $434,999 | 1 | 360,290 | 48,930 | - | - | 409,220 |
| $795,000 to $824,999 | 2 | 388,656 | 40,715 | - | 386,496 | 815,867 |
| **Total** | 255 | | | | | |

**Note 32 (c) Average annual reportable remuneration paid to other highly paid staff during the reporting period - Consolidated**

| | | | 2013 | | | |
|---|---|---|---|---|---|---|
| **Average annual reportable remuneration**[1] | Highly paid staff No. | Reportable salary[2&6] $ | Contributed superannuation[3] $ | Reportable allowances[4] $ | Bonus paid[5] $ | Total $ |
| **Total reportable remuneration (including part time arrangements)** | | | | | | |
| $195,000 to $224,999 | 139 | 175,346 | 25,974 | - | 4,798 | 206,118 |
| $225,000 to $254,999 | 62 | 194,382 | 27,935 | - | 16,222 | 238,539 |
| $255,000 to $284,999 | 9 | 201,296 | 39,635 | - | 27,957 | 268,888 |
| $285,000 to $314,999 | 2 | 200,236 | 73,733 | - | 26,324 | 300,293 |
| $315,000 to $344,999 | 5 | 246,425 | 29,167 | - | 55,897 | 331,489 |
| $345,000 to $374,999 | 2 | 266,832 | 40,570 | - | 52,966 | 360,368 |
| $375,000 to $404,999 | 1 | 62,250 | 7,916 | - | 314,699 | 384,865 |
| **Total** | 220 | | | | | |

***Notes*:**

[1] This table reports staff:

a) who were employed by the entity during the reporting period;

b) whose reportable remuneration was $195,000 or more for the financial period; and

c) were not required to be disclosed in Table B or director disclosures.

Each row is an averaged figure based on headcount for individuals in the band.

[2] 'Reportable salary' includes the following:

a) gross payments (less any bonuses paid, which are separated out and disclosed in the 'bonus paid' column);

b) reportable fringe benefits (at the net amount prior to 'grossing up' for tax purposes);

c) exempt foreign employment income;

d) salary sacrificed benefits; and

e) termination benefits paid in 2013-14 where applicable.

[3] The 'contributed superannuation' amount is the average cost to the entity for the provision of superannuation benefits to other highly paid staff in that reportable remuneration band during the reporting period.

[4] 'Reportable allowances' are the average actual allowances paid as per the 'total allowances' line on individuals' payment summaries.

[5] 'Bonus paid' represents average actual bonuses paid during the reporting period in that reportable remuneration band. The 'bonus paid' within a particular band may vary between financial years due to various factors such as individuals commencing with or leaving the entity during the financial year.

[6] Various salary sacrifice benefits are reported in the 'reportable salary' column, including salary sacrificed superannuation.

Note – Consolidated table includes one WLAN employee disclosed in 2013-14 in the salary band $795,000 to $824,999 (2012-13: $375,000 to $404,999).

## Note 33: Meetings of the Board and Board Committees

During the financial year 2013-14, eleven Board meetings (six out of session), five Board Audit & Risk Committee meetings and five Board People, Health & Safety Committee meetings were held. The number of meetings attended by each of the Board members was as follows:

| Board member | CSIRO Board | | CSIRO Board Audit & Risk Committee | | CSIRO Board People, Health & Safety Committee | |
|---|---|---|---|---|---|---|
| | Number eligible to attend as a member | Number attended | Number eligible to attend as a member | Number attended | Number eligible to attend as a member | Number attended |
| J Bennett | **11** | **11** | **5** | **5** | **-** | **3** |
| M S Boydell | **11** | **11** | **5** | **5** | **-** | **4** |
| M E Clark | **11** | **10** | **-** | **5** | **-** | **4** |
| E J Doyle | **11** | **11** | **5** | **5** | **5** | **5** |
| P Høj | **11** | **9** | **5** | **3** | **-** | **-** |
| S In't Veld | **11** | **9** | **5** | **5** | **-** | **2** |
| S V McKeon | **11** | **11** | **-** | **3** | **5** | **5** |
| J H Ranck | **11** | **11** | **-** | **1** | **5** | **4** |
| P W Riddles * | **3** | **2** | **-** | **1** | **-** | **1** |
| T H Spurling | **11** | **11** | **-** | **3** | **5** | **5** |

***Notes***:

Dr Riddles was appointed on 24 April 2014.

## Note 33: Meetings of the Board and Board Committees – (cont)

During the financial year 2012-13, twelve Board meetings (six out of session), seven Board Audit & Risk Committee meetings (one out of session) and seven Board People, Health & Safety Committee meetings (three out of session) were held. The number of meetings attended by each of the Board members was as follows:

| Board member | CSIRO Board | | CSIRO Board Audit & Risk Committee | | CSIRO Board People, Health & Safety Committee | |
|---|---|---|---|---|---|---|
| | Number eligible to attend as a member | Number attended | Number eligible to attend as a member | Number attended | Number eligible to attend as a member | Number attended |
| J Bennett * | 9 | 9 | 1 | 2 | - | 1 |
| M S Boydell | 12 | 12 | 7 | 7 | - | 3 |
| M E Clark | 12 | 12 | - | 6 | - | 7 |
| T A Cutler * | - | - | - | - | - | - |
| E J Doyle | 12 | 12 | 7 | 7 | 7 | 6 |
| P Høj | 12 | 11 | 7 | 5 | - | - |
| S In't Veld | 12 | 8 | 1 | 2 | - | - |
| S V McKeon | 12 | 12 | - | 6 | 7 | 6 |
| J H Ranck | 12 | 10 | - | 4 | 7 | 7 |
| D Russell * | 3 | 2 | - | - | - | - |
| T H Spurling | 12 | 12 | - | 4 | 7 | 7 |

***Notes***:

Dr Cutler's term expired on 24 July 2013. Dr Russell resigned effective 2 November 2012. Ms Bennett was appointed on 25 October 2012.

## Note 34: Related party disclosures

**(a) Controlled Entities**

SIEF was established under the *Science and Industry Endowment Act 1926*. The Fund is deemed to be a CSIRO controlled entity in accordance with AASB 127 *Consolidated and Separate Financial Statements* and UIG 112. The Science and Industry Endowment Fund's separate financial statements are reported in the CSIRO Annual Report.

The principal activity of the SIEF is to provide assistance to persons engaged in scientific research and in training of students in scientific research.

WLAN was established in 2005. The company is a CSIRO controlled entity in accordance with AASB 127 *Consolidated and Separate Financial Statements* and UIG 112. The principal activity is to provide services to CSIRO.

The Fundación was established in October 2013. The Fundación is a controlled entity governed by a Board in accordance with the Constitution of the Fundación. The Centre is working with industry and leading Chilean Universities to develop cutting-edge technologies to reduce the environmental impact of mining and increase its productivity.

| Names | CSIRO Investment Amount | | % Equity Interest Held | | Board Control | |
|---|---|---|---|---|---|---|
| | **2014** | 2013 | **2014** | 2013 | **2014** | 2013 |
| | **$** | $ | | | | |
| SIEF | **-** | - | **100%** | 100% | **-** | - |
| WLAN | **1** | 1 | **100%** | 100% | **-** | - |
| Fundación | **-** | - | **-** | - | **Yes** | - |
| Total | **1** | 1 | | | | |

**(b) Board Members**

The Board Members of the Group during the financial year were:

S V McKeon AO (Chairman)
E J Doyle (Deputy Chairman)
M E Clark AC (Chief Executive)
J Bennett
M S Boydell
P Høj
S In't Veld
J H Ranck
P W Riddles (Appointed April 2014)
T H Spurling AM

Remuneration – the aggregate remuneration of Board Members is disclosed in Note 31.

**(c) Board Members' interest in contracts**

Since 1 July 2013 no Board Member of CSIRO has received or become entitled to receive a benefit, other than a benefit included in the aggregate amount of remuneration received or due and receivable shown in Note 31 by reason of a contract made by CSIRO with the Board Member or with a firm of which the Board Member is a member or with a company in which the Board Member has a substantial financial interest.

This information relates to the period 1 July 2013 to 30 June 2014.

## Note 34: Related party disclosures (cont)

**(d) Other transactions of Board Members – related entities**

Ms J Bennett is a non-Executive Director of Australian Farm Institute, Australian Broadcasting Corporation and Tasmanian Ports Corporation. Ms Bennett is the former Chair, and a current Member of the Tasmanian Food Industry Advisory Council and a Member of the Board of the Brand Tasmania Council. During 2013-14 Ms Bennett commenced as a Board Member of Nuffield Australia and a non-Executive Director of The Van Diemen's Land Company, and ceased as a non-Executive Director of the Tasmanian Water and Sewerage Corporations Northern Region (trading as Ben Lomond Water) and Tasmanian Water and Sewerage Corporations Common Services (trading as Onstream). All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Ms M S Boydell is the Chair of the Gladstone Area Water Board. Ms Boydell is a Director of Uniquest Pty Limited and UATC Pty Ltd and other private companies. During 2013-14 Ms Boydell was appointed Executive Chair of Yalari Limited and declared her Directorship of Eagle Street Associates Pty Ltd. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Dr M E Clark is a member of the Prime Minister's Science, Engineering and Innovation Council, a member of the STS Forum's Council, a member of the Executive Committee of the Global Research Alliance, National Precincts Board, Advisory Council of the Global Foundation and the Business Council of Australia Panel on Industry Value Add. Dr Clark is also a Director of a family company, registered 27 June 2011: Cradle Mountain Carbon Pty Ltd. ACN 151 512 220, the business purpose of which is as a vehicle to hold land for conservation. Dr Clark is a Director of a family company, registered 27 February 2007: Ballantyne Holdings Pty Ltd. ACN 008 729 002, the business purpose of which is commercial property. She is also trustee of the Science and Industry Endowment Fund, a member of the Australia Advisory Board of Bank of America Merrill Lynch and a member of the Chairman's panel of the Great Barrier Reef Foundation. During 2013-14 the Manufacturing Leaders Group and the World Economic Forum - Global Advisory Council for Measuring Sustainability, of which she was a member, both ceased. Dr Clark also ceased as Chair of the Mining for Development Advisory Board for AusAID. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Dr E J Doyle is Chair of both the Hunter Valley Research Foundation and the Hunter Founders Forum. She is a Non Executive Director of the GPT Group of companies, Boral Ltd, Bradken Limited, Newcastle Port Corporation and various private companies. Dr Doyle is also a Conjoint Professor at the University of Newcastle, Graduate School of Business. During 2013-14 Dr Doyle became a member of O'Connell Street Associates and ceased as a member of the Enterprise Connect Advisory Council. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Professor P Høj is President and Vice Chancellor of The University of Queensland. He is a Fellow of the Australian Academy of Technological Sciences and Engineering and a foreign member of the Danish Academy of Sciences and Letters. He is a member of the Australian Research Committee (ARCom), Co-Deputy Chair of Strengthened Export Controls Steering Group and member of the Q20 - established by the Government to work to maximise the benefits to Queensland of Australia's presidency of the G20. During 2013-14 Professor Høj was appointed as Senior Consultant to Hanban (Confucius Institute Headquarters) and became an Advisory Board Member of EdX. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Ms S In't Veld is a Director of Asciano Limited. She is also an Advisory Council Member of SMART Infrastructure and a council member of AICD (WA), a non-Executive Director of the DUET Group and a member of the CSIRO Energy Strategic Advisory Committee. During 2013-14 Ms In't Veld was appointed Nominee Director for Sunsuper and Group Super (Commonwealth Bank) for Perth Airport, a non-Executive Director of Juniper Uniting Church Community and a Panel Member of the Renewable Energy Target (RET) Review. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

## Note 34: Related party disclosures (cont)

**(d) Other transactions of Board Members – related entities**

Mr S V McKeon is Chair of Global Poverty Project Australia Pty Ltd, a Director of Red Dust Role Models, a Fellow of the Australian Institute of Company Directors and Chair of In2Science. During 2013-14 he was appointed Chair of AMP Limited and a Business Events Ambassador for the Northern Territory Government. During 2013-14 he retired as Chair of Business for Millennium Development and as a Director of Global Poverty Project Inc. He also retired as Executive Chair of Macquarie Group's Melbourne Office and is now a consultant, although he retains the title of Chair, Melbourne Office. The AusAid Business Engagement Steering Committee, Federal Government's Human Rights Grants Scheme Advisory Panel and Victorian Government's National Disability Insurance Scheme Implementation Taskforce of which Mr McKeon was a member, have now ended. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Mr J H Ranck is a Director of Innotegic Pty Ltd and Iluka Resources, a member of the Sydney University Senate Committee on Risk and Safety and and a fellow of the Australian Institute of Company Directors. During 2013-14 Mr Ranck was appointed Chair of Elders Limited having previously served as a Director. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Dr P W Riddles is Founder and Director of ViciBio Pty Ltd, a Director of the Hear and Say Centre for Deaf Children and the National Stem Cell Foundation of Australia. Dr Riddles is also Chair of Life Sciences Queensland, Wound Management Innovation CRC and Griffith Enterprise Advisory Board, a Member of the Alberta Research and Innovation Authority, Canada and a Fellow of the California Technology Council. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

Professor T H Spurling is a member of the Board of the International Centre for Radio Astronomy Research, Chair of Advanced Molecular Technologies Pty Ltd and a Fellow of the Australian Academy of Technological Sciences and Engineering (ATSE). He is a member of Working Group #4 of the Australian Council of Learned Academies (ACOLA) project to prepare a series of papers under the general title 'Securing Australia's Future'. Professor Spurling is representing ATSE on this project. During 2013-14 Professor Spurling moved from the Faculty of Life and Social Sciences at Swinburne University, to the Faculty of Business and Enterprise, as Director of the Centre for Transformative Innovation. He was also appointed as a Member of the RMIT University Design Research Institute Commercial and Industrial Committee, a Member of the Science and Engineering Advisory Committee of EPA Victoria and an Advisory Committee Member (representing the Chief Scientist of Victoria) of the Australian Institute for Teaching and School Leadership. All contracts and transactions between these entities and CSIRO are based on normal commercial terms and conditions and there is no personal benefit to the CSIRO Board Member.

## Note 35: Financial instruments

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **(a) Categories of financial instruments** | | | | | |
| **Financial Assets** | | | | | |
| **Available for sale financial assets** | | | | | |
| Investments | 10 | **14,621** | 10,520 | **14,621** | 10,520 |
| **Loans and receivables** | | | | | |
| Cash at bank | 7 | **29,101** | 48,417 | **25,982** | 45,013 |
| Term deposits | 7 | **369,072** | 356,221 | **269,593** | 238,000 |
| Receivable for goods and services | 8 | **60,278** | 82,112 | **61,795** | 82,112 |
| Other receivables | 8 | **7,335** | 85,488 | **2,646** | 86,471 |
| **Carrying amount of financial assets** | | **480,407** | 582,758 | **374,637** | 462,116 |
| **Financial Liabilities** | | | | | |
| Finance lease liabilities | 21 | **53,475** | 57,243 | **53,475** | 57,243 |
| Trade creditors | 19 | **54,773** | 62,433 | **54,347** | 61,779 |
| Research revenue received in advance | 20 | **96,791** | 93,193 | **97,691** | 93,193 |
| Deposits | 22 | **4,567** | 6,337 | **4,567** | 6,337 |
| Other creditors | 20 | **84,306** | 88,269 | **80,254** | 87,860 |
| **Carrying amount of financial liabilities** | | **293,912** | 307,475 | **290,334** | 306,412 |
| **(b) Net income and expense from financial assets** | | | | | |
| Cash at bank and term deposits | | | | | |
| Interest revenue | 4.2 | **13,908** | 18,070 | **9,464** | 11,529 |
| **Net gain from financial assets** | | **13,908** | 18,070 | **9,464** | 11,529 |
| **(c) Net income and expense from financial liabilities** | | | | | |
| Finance Leases | | | | | |
| Interest expense | 3.4 | **2,891** | 2,865 | **2,888** | 2,864 |
| **Net loss from financial liabilities** | | **2,891** | 2,865 | **2,888** | 2,864 |

**(d) Fair value of financial instruments**

A comparison between the fair value and carrying amount of the Group's financial assets and liabilities is not disclosed because the Group considers that the carrying amounts reported in the Statement of Financial Position are a reasonable approximation of the fair value of these financial assets and liabilities.

## Note 35: Financial instruments (cont)

### (e) Credit risk

The maximum exposure to credit risk is the risk that arises from potential default of a debtor. This amount is equal to the total amount of trade and other receivables of $63.8 million (2013 $167.7 million). The Group has assessed the risk of the default on payment and has allocated $0.6 million (2013 $0.8 million) to an allowance for impairment account.

The Group manages its credit risk by undertaking background and credit checks prior to allowing a debtor relationship. In addition, the Group has policies and procedures that guide employees to apply debt recovery techniques. The Group holds no collateral to mitigate against credit risk.

**Credit risk of financial instruments not past due or individually determined as impaired - Consolidated**

| | Notes | **Not past due nor impaired** | Not past due nor impaired | **Past due or impaired** | Past due or impaired |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| Cash at bank | 7 | **29,101** | 48,417 | **-** | - |
| Term deposits | 7 | **369,072** | 356,221 | **-** | - |
| Receivables for goods and services | 8 | **49,198** | 71,007 | **11,080** | 11,105 |
| Other receivables | 8 | **7,335** | 85,488 | **-** | - |
| Investments | 10 | **14,621** | 10,520 | **-** | - |
| **Total** | | **469,327** | 571,653 | **11,080** | 11,105 |

**Credit risk of financial instruments not past due or individually determined as impaired - CSIRO**

| | Notes | **Not past due nor impaired** | Not past due nor impaired | **Past due or impaired** | Past due or impaired |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| Cash at bank | 7 | **25,982** | 45,013 | **-** | - |
| Term deposits | 7 | **269,593** | 238,000 | **-** | - |
| Receivables for goods and services | 8 | **50,722** | 71,007 | **11,073** | 11,105 |
| Other receivables | 8 | **2,646** | 86,471 | **-** | - |
| Investments | 10 | **14,621** | 10,520 | **-** | - |
| **Total** | | **363,564** | 451,011 | **11,073** | 11,105 |

**Ageing of financial assets that were past due but not impaired for 2014 - Consolidated**

| | **0 to 30 days** | **31 to 60 days** | **61 to 90 days** | **90+ days** | **Total** |
|---|---|---|---|---|---|
| | **$'000** | **$'000** | **$'000** | **$'000** | **$'000** |
| Receivables for goods and services | **9,589** | **997** | **177** | **317** | **11,080** |
| **Total** | **9,589** | **997** | **177** | **317** | **11,080** |

Ageing of financial assets that were past due but not impaired for 2013 - Consolidated

| | 0 to 30 days | 31 to 60 days | 61 to 90 days | 90+ days | Total |
|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 |
| Receivables for goods and services | 8,181 | 1,216 | 281 | 1,427 | 11,105 |
| Total | 8,181 | 1,216 | 281 | 1,427 | 11,105 |

**(e) Credit risk** (cont)

**Ageing of financial assets that were past due but not impaired for 2014 - CSIRO**

| | 0 to 30 days | 31 to 60 days | 61 to 90 days | 90+ days | Total |
|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 |
| Receivables for goods and services | 9,582 | 997 | 177 | 317 | 11,073 |
| **Total** | 9,582 | 997 | 177 | 317 | 11,073 |

Ageing of financial assets that were past due but not impaired for 2013 - CSIRO

| | 0 to 30 days | 31 to 60 days | 61 to 90 days | 90+ days | Total |
|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 |
| Receivables for goods and services | 8,181 | 1,216 | 281 | 1,427 | 11,105 |
| Total | 8,181 | 1,216 | 281 | 1,427 | 11,105 |

**(f) Liquidity risk**

The Group's financial liabilities are payables, finance leases and other interest bearing liabilities. The exposure to liquidity risk is based on the notion that the Group will encounter difficulty in meeting its obligations associated with financial liabilities. This is highly unlikely due to Australian Government funding and internal policies and procedures put in place to ensure there are appropriate resources to meet its financial obligations.

The Group manages its budgeted funds to ensure it has adequate funds to meet payments as they fall due. In addition, the Group has policies in place to ensure timely payments are made when due and has no past experience of defaults.

**The following table illustrates the maturities for financial liabilities for 2014 - Consolidated**

| | On demand | Within 1 year | 1 to 5 years | > 5 years | Total |
|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 |
| Finance lease liabilities | - | 5,929 | 17,479 | 30,067 | 53,475 |
| Trade creditors | - | 54,773 | - | - | 54,773 |
| Research revenue received in advance | - | 96,791 | - | - | 96,791 |
| Deposits | 4,567 | - | - | - | 4,567 |
| Other creditors | - | 84,306 | - | - | 84,306 |
| **Total** | 4,567 | 241,799 | 17,479 | 30,067 | 293,912 |

The following table illustrates the maturities for financial liabilities for 2013 - Consolidated

| | On demand | Within 1 year | 1 to 5 years | > 5 years | Total |
|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 |
| Finance lease liabilities | - | 4,965 | 18,135 | 34,143 | 57,243 |
| Trade creditors | - | 62,433 | - | - | 62,433 |
| Research revenue received in advance | - | 93,193 | - | - | 93,193 |
| Deposits | 6,337 | - | - | - | 6,337 |
| Other creditors | - | 88,269 | - | - | 88,269 |
| Total | 6,337 | 248,860 | 18,135 | 34,143 | 307,475 |

**(f) Liquidity risk** (cont)

**The following table illustrates the maturities for financial liabilities for 2014 - CSIRO**

| | On demand | Within 1 year | 1 to 5 years | > 5 years | Total |
|---|---|---|---|---|---|
| | **$'000** | **$'000** | **$'000** | **$'000** | **$'000** |
| Finance lease liabilities | **-** | **5,929** | **17,479** | **30,067** | **53,475** |
| Trade creditors | **-** | **54,347** | **-** | **-** | **54,347** |
| Research revenue received in advance | **-** | **97,691** | **-** | **-** | **97,691** |
| Deposits | **4,567** | **-** | **-** | **-** | **4,567** |
| Other creditors | **-** | **80,254** | **-** | **-** | **80,254** |
| **Total** | **4,567** | **238,221** | **17,479** | **30,067** | **290,334** |

The following table illustrates the maturities for financial liabilities for 2013 - CSIRO

| | On demand | Within 1 year | 1 to 5 years | > 5 years | Total |
|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 |
| Finance lease liabilities | - | 4,965 | 18,135 | 34,143 | 57,243 |
| Trade creditors | - | 61,779 | - | - | 61,779 |
| Research revenue received in advance | - | 93,193 | - | - | 93,193 |
| Deposits | 6,337 | - | - | - | 6,337 |
| Other creditors | - | 87,860 | - | - | 87,860 |
| Total | 6,337 | 247,797 | 18,135 | 34,143 | 306,412 |

**(g) Market risk**

The Group holds basic financial instruments that do not expose the Group to certain market risks except for equity price risk for its 'available for sale' equity investments. See Note 9.

**Interest rate risk**

The only interest-bearing items on the Statement of Financial Position are finance leases. They all bear interest at a fixed interest rate and will not fluctuate due to changes in the market interest rate.

**Equity price risk**

Equity price risk arises from changes in market prices of listed equity investments that the Group has designated as 'available for sale' financial instruments. See Note 10.

**Sensitivity analysis**

The Group's listed equity investments are listed on the Australian Stock Exchange (ASX). For such instruments classified as 'available for sale', a 10% increase in the ASX All Ordinary Index at the reporting date would have increased equity by $0.4 million (2013: $0.3 million). An equal change in the opposite direction would have decreased equity by $0.4 million (2013: $0.3 million). The analysis is performed on the same basis for 2013.

**Currency risk**

In accordance with Australian Government policy, the Group is prohibited from entering into foreign currency hedges.

The Group's exposure to foreign exchange risk on sales and purchases that are denominated in currencies other than the Australian dollar is not considered material. At any point in time the Group's foreign currency risk exposure is not material.

## Note 36: Financial assets and liabilities reconciliation

| | Notes | Consolidated | | CSIRO | |
|---|---|---|---|---|---|
| | | **2014** | 2013 | **2014** | 2013 |
| | | **$'000** | $'000 | **$'000** | $'000 |
| **(a) Financial assets** | | | | | |
| Total financial assets as per Statement of Financial Position | | **484,430** | 585,703 | **378,067** | 463,720 |
| Add: non-financial instrument components | | | | | |
| Impairment allowance for goods and services | 8 | **644** | 834 | **644** | 834 |
| Less: non-financial instrument components | | | | | |
| GST receivable from ATO | | **(4,358)** | (3,433) | **(3,765)** | (2,092) |
| Investments accounted for using equity method | 9 | **(309)** | (346) | **(309)** | (346) |
| **Total financial instrument components** | | **(4,023)** | (2,945) | **(3,430)** | (1,604) |
| **Total financial assets as per financial instrument note** | 35(a) | **480,407** | 582,758 | **374,637** | 462,116 |
| **(b) Financial liabilities** | | | | | |
| Total financial liabilities as per Statement of Financial Position | | **553,250** | 574,413 | **549,672** | 573,350 |
| Less: non-financial instrument components | | | | | |
| Employee provisions | 23 | **(259,338)** | (266,938) | **(259,338)** | (266,938) |
| **Total non-financial instrument components** | | **(259,338)** | (266,938) | **(259,338)** | (266,938) |
| **Total financial liabilities as per financial instrument note** | 35(a) | **293,912** | 307,475 | **290,334** | 306,412 |

## Note 37: Reporting of outcome

**(a) Reporting of outcome**

The Groups outputs contribute to a single outcome:

Innovative scientific and technology solutions to national challenges and opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.

| **(b) Net cost of outcome delivery** | **Consolidated** | | **CSIRO** | |
|---|---|---|---|---|
| | **2014** | 2013 | **2014** | 2013 |
| | **$'000** | $'000 | **$'000** | $'000 |
| **Total expenses**[1] | **1,283,291** | 1,281,442 | **1,270,662** | 1,267,577 |
| **Income from non-government sector** | | | | |
| Other external revenues: | | | | |
| Sale of goods and rendering of services - to related entities | **148,192** | 108,452 | **158,732** | 120,863 |
| Sale of goods and rendering of services - to external entities | **235,712** | 304,904 | **235,713** | 304,299 |
| Interest | **13,908** | 18,070 | **9,464** | 11,529 |
| Net gains from sale of assets | **-** | - | **-** | - |
| Net foreign exchange gains | **-** | 5,454 | **-** | 5,454 |
| Donations | **153** | 51 | **153** | 51 |
| Rents | **7,096** | 7,176 | **7,096** | 7,176 |
| Royalties | **29,133** | 37,548 | **29,133** | 37,548 |
| Net gains from sale of investments | **-** | - | **-** | - |
| Sale of primary produce | **1,064** | 1,721 | **1,064** | 1,721 |
| Other | **26,053** | 23,110 | **25,412** | 23,581 |
| **Total other own-source income** | **461,311** | 506,486 | **466,767** | 512,222 |
| **Net cost of outcome delivery** | **821,980** | 774,956 | **803,895** | 755,355 |

[1] Total expenses adjusted for movement in equity investment.

# Part 5 | Appendices



A new proven technique that detects gold more accurately in mined rock has the potential to save Australia's minerals industry millions of dollars worth of gold each year. Read more on page 75.

## Appendix 1 | Service Charter

CSIRO's Service Charter describes the standards of service we aim to deliver to our customers and our commitment to ensuring that these standards are maintained.

In summary:

- we believe our customers and partners are essential to our success
- we maintain relevance in our work through input from the public, government, industry and the research community
- we communicate with our customers in a courteous, helpful and professional manner
- we respect our customers' confidentiality
- we evaluate our services to ensure the highest standards.

Our full Service Charter is available on our website: www.csiro.au/servicecharter

CSIRO welcomes your feedback on our performance. Please contact the CSIRO officer with whom you have been dealing or CSIRO Enquiries who can direct your feedback to the relevant person.

**CSIRO Enquiries**
Bag 10, Clayton South, VIC 3169
**t** 1300 363 400
+61 3 9545 2176
**e** enquiries@csiro.au

## Appendix 2 | Administrative law

### FREEDOM OF INFORMATION

The *Freedom of Information Act 1982* (FOI Act) provides the public with a general right of access to documents held by Australian Government agencies including CSIRO. The general right is limited by exceptions to protect essential public interests or the privacy or business affairs of those who give information to the agency. In the reporting year to 30 June 2014, CSIRO received 14 requests for information under the FOI Act.

The following information is provided in compliance with Section 8 of the FOI Act:

- the functions and powers of CSIRO are set out on page 98
- information about CSIRO's procedures for external consultation can be found at www.csiro.au/SAC
- CSIRO holds the following categories of documents:
  - corporate records including documents relating to government, policy, finance, personnel, business development, commercialisation, communication, real property, intellectual property and education
  - business unit records including documents relating to scientific research and technology transfer
- members of the public may obtain access to scientific and technical publications from CSIRO Publishing (www.publish.csiro.au) and the ePublish repository (https://publications.csiro.au). CSIRO administrative manuals are available from the FOI Officer.

Part V of the FOI Act confers a right to request CSIRO to amend a document to which lawful access has been granted, where the applicant claims that information in the document:

- relates to his or her personal affairs
- is incomplete, incorrect, out-of-date or misleading
- has been used, is being used, or is available for use by the agency or Minister for an administrative purpose.

In the reporting year to 30 June 2014, CSIRO received no requests for amendments of personal information under the FOI Act.

## INFORMATION PUBLICATION SCHEME

CSIRO is required to publish information to the public as part of the Information Publication Scheme (IPS). This requirement is in Part II of the FOI Act and has replaced the former requirement to publish a Section 8 statement in an annual report. CSIRO displays on its website a plan showing what information it publishes in accordance with the IPS requirements.

## ARCHIVES, PRIVACY AND ADMINISTRATIVE DECISIONS

CSIRO maintains an archives collection which includes records dating from the establishment in 1926 of the Council for Science and Industrial Research, the predecessor of CSIRO. Certain CSIRO records are held by Australian Archives. Disposal arrangements for CSIRO records are made in accordance with the provisions of the *Archives Act 1983*. Access to records over 20 years old is provided in accordance with that Act.

The *Privacy Act 1988* provides for Information Privacy Principles and National Privacy Principles. During 2013-2014, the Office of the Australian Information Commissioner did not undertake any investigations under Section 36 of the *Privacy Act 1988* in relation to CSIRO.

The *Administrative Decisions (Judicial Review) Act 1977* (ADJR Act) enables a person aggrieved by certain classes of administrative decisions made by Australian Government agencies, including CSIRO, to obtain reasons for or to challenge those decisions. During 2013–14, CSIRO received no challenges or requests for statements of reasons under the ADJR Act.

## CONTACT

All enquiries under the above legislation (including FOI requests) should be directed to:

FOI and Privacy Officer
CSIRO, PO Box 225
Campbell ACT 2602

**t** +61 2 6276 6123
**f** +61 2 6276 6437
**e** rosemary.caldwell@csiro.au

## PUBLIC INTEREST DISCLOSURE

The *Public Interest Disclosure Act 2013* (PID Act) came into effect on 15 January 2014, internal procedures have been developed and implemented to enable compliance through a Public Interest Disclosure (PID) Scheme. The PID Scheme promotes integrity and accountability by encouraging the disclosure of information about suspected wrongdoing, protecting people who make disclosures and ensuring CSIRO takes appropriate action. CSIRO has contributed to the Commonwealth Ombudsman's Annual Report on the PID, as required in Section 76(3) of the PID Act, in 2014 CSIRO reported three disclosures.

# Appendix 3 | Consultancy services

CSIRO engages consultants where it lacks specialist expertise or when independent research, review or assessment is required. Consultants are typically engaged to investigate or diagnose a defined issue or problem, carry out defined reviews or evaluations, or provide independent advice, information or creative solutions to assist in the CSIRO's decision-making.

Prior to engaging consultants, CSIRO takes into account the skills and resources required for the task, the skills available internally and the cost-effectiveness of engaging external expertise. The decision to engage a consultant is made in accordance with the Commonwealth Procurement Rules (CPRs), CSIRO's procurement policy and other relevant internal policies.

CSIRO's policy on selection and engagement of consultants is based on the principles of:

- value for money
- open and effective competition
- ethics and fair dealing
- accountability and reporting
- national competitiveness and industry development
- support for other Australian Government policies.

These principles are included within CSIRO's Procurement Policy and Procedures.

Tables 5.1, 5.2 and 5.3 summarise the consultancies let and the annual spend, the reason for the consultancy and the procurement method. All values include goods and services tax.

**TABLE 5.1: ANNUAL SPEND ON CONSULTANCIES**

| YEAR | SPENT $ | LET $ (ESTIMATED WHOLE OF LIFE) |
|---|---|---|
| 2013–14 | 5,294,552 | 5,796,633 |
| 2012–13 | 1,104,000 | 1,417,754 |
| 2011–12 | 1,621,697 | 1,096,277 |
| 2010–11 | 1,845,670 | 1,917,497 |

**TABLE 5.2: CONSULTANCIES 2013–14 – SUMMARY BY REASON CODE**

| CATEGORY CODE | REASON FOR CONSULTANCY | NUMBER OF CONSULTANCIES | VALUE $ |
|---|---|---|---|
| **IS** | Need for independent study/evaluation | 5 | 488,635 |
| **PA** | Need for professional assistance to manage and facilitate change and its consequence | 0 | 0 |
| **SS** | Specialist skills were not otherwise available | 10 | 5,307,998 |
| **Total** | | **15** | **5,796,633** |

**TABLE 5.3: SUMMARY BY PROCUREMENT METHOD CODE, 2013–14**

| CATEGORY CODE | PROCUREMENT METHOD | NUMBER OF CONSULTANCIES | VALUE $ |
|---|---|---|---|
| **OT** | Tenders sought from the market place through Open Approach (Request for Proposal, Request for Tender, Expressions of Interest). | 0 | 0 |
| **PM** | An existing panel member – this category includes standing offers, common use arrangements and approved supplier panels. | 1 | 66,000 |
| **ST** | Tenders being sought from suppliers who have pre-qualified through some form of previous competitive process. | 1 | 4,500,000 |
| **RQ** | Purchasing was undertaken in accordance with Division 1 of the CPRs and procurement did not require application of Division 2 of the CPRs. | 12 | 931,683 |
| **EX** | Exemption applied that saw CSIRO undertake the procurement as a Limited Tender as defined in Division 2 of the CPRs. | 1 | 298,950 |
| **Total** | | **15** | **5,796,633** |

# Appendix 4 | Science and Industry Endowment Fund Annual Report 2013–14

## TRUSTEE'S REPORT

When CSIRO gifted $150 million to the Science and Industry Endowment Fund (SIEF) in 2009 from its WLAN patent, the Fund recognised that the proceeds of an invention of global significance need to be re-invested in science with worldwide importance and impact. Almost five years on, as Trustee of SIEF I am proud of the range of projects and initiatives the Fund has supported.

These years have been filled with intensive investment activities by the Fund, with almost $120 million committed. The Fund is now moving to a new phase – evaluating its impact. Over the past 12 months, along with regular progress reports, eight Research Projects have undergone major, mid-project reviews. These reviews provide a thorough assessment of path to impact, end-user engagement, intellectual property, future investment options and continued alignment to SIEF's strategic objectives.

It is my pleasure and privilege to share some of this year's highlights from the Fund.

### Supporting research of global significance and impact

The Great Barrier Reef is subject to threats including climate change, water quality and coastal development. Timely access to accurate water quality information is essential to maintain a vibrant, healthy reef ecosystem. The *eReefs* Project is the first step towards comprehensive coastal information systems for Australia.

The SIEF Research Project, *Transforming the Science and Management of the Great Barrier Reef,* developed the first tool to come out of *eReefs*. The Marine Water Quality Dashboard was officially launched in March 2014, providing public access to over ten years of water quality information. It allows identification of changes over time, plus up-to-date assessments of the likelihood of events such as coral bleaching or the impact of sediment plumes from large rainfalls. The knowledge and tools generated through *eReefs* will be applicable across Australia's coastline as well as internationally.

**The Marine Water Quality Dashboard provides public access to over ten years of water quality information. Image: iStock**

**Insight into fundamental plant breeding aspects could see unique hybrid plant traits preserved from generation to generation.**

***Solving the Energy Waste Roadblock* is identifying new materials to capture carbon dioxide and convert it into useful products. Image: University of Sydney**

Hybrid crop production has been a major plant breeding strategy in many different crops for more than a century. Understanding the molecular and cellular basis of hybrid vigour and methods to preserve it in subsequent seed generations will provide new opportunities to enhance crops with existing hybrids and create opportunities for new hybrid crops. This is especially important as global food demand increases and is expected to double by 2050.

The SIEF-supported Research Project *New Methodologies in Plant Breeding for Creating and Perpetuating Major Yield Increases* (*Plant Breeding*) provided insight into two fundamental aspects of plant breeding that could see the unique traits of hybrids preserved from generation to generation. These discoveries attracted international attention, resulting in further international funding of over $14 million.

Annual global emissions of carbon dioxide have increased by approximately 80 per cent since 1970. A major challenge for reducing greenhouse gas emissions is developing new materials and processes to capture and store carbon dioxide. The SIEF *Solving the Energy Waste Roadblock* project is identifying new materials to capture carbon dioxide and convert it into useful products. To date the project is the first in the world to report an effective means to totally inhibit physical aging of membrane materials without any gas permeability or selectivity performance loss, leading to two provisional patents, as well as developed a material which, after absorbing carbon dioxide, will release it with simple irradiation by concentrated sunlight.

## Supporting industry, sustainability and productivity

In selecting activities to be funded by SIEF I aim to ensure a broad spread of development maturity.

This includes research which is:

- *Emerging:* promising or new fields of research
- *Strategic:* applying new fields to threats, challenges or opportunities arising in or for Australia
- *Supporting:* established or long-term research programs that aim to deliver scientific advances by translating solutions to real world problems.

The final round of Research Projects (finalised in mid-2013) had a strong preference for proposals at the *supporting* level, with an emphasis on industry and end-user involvement. Projects selected were in:

- Manufacturing: *High performance solar cell technology with integrated nanoplasmonic thin film and thermal management systems* and *Manufacture of a small demonstrator aero-engine entirely through additive manufacturing*
- Resources: *Distal Footprints of Giant Ore Systems: UNCOVER Australia*
- Agriculture: *Forests for the future: making the most of a high $CO_2$ world*
- Digital age: *Big-Data Knowledge Discovery.*

## Supporting development of Australian researchers

For Australia to remain scientifically and economically competitive, we must foster skilled, savvy, highly motivated early-career researchers as the leaders of tomorrow. The SIEF Promotion of Science Program supports outstanding candidates at the early-career stage, providing them with the financial support to reach their potential and allow them to undertake research across a broad spectrum and of national importance. Examples range from basic research in astronomy (*New Dimensions in galaxy evolution*) and biology (*Epigenetic regulation of gene expression by DNA methylation in insect models*) to practical solutions to real-world problems (*Recycling E-waste Metals and Polymers for Recovery of Value-Added Materials* and *Next generation biomedical materials based on highly ordered colloid crystals*).

## Supported by SIEF advisory bodies

My role as Trustee has been greatly assisted by the Fund's Advisory Council, Expert Panel and Undergraduate Degree Panel. The loyal members of these bodies have supported the Fund by providing constant guidance and insight on a *pro bono* basis. Their contributions have ensured investments are directed to where the greatest achievement can be made for global significance and impact, sustainability and productivity of Australia's industries and valued development of our future science leaders.

My gratitude to these supporters of the Fund, both personally and on behalf of Australian science, is profound.

### Advisory Council

Prof Alan Robson (Chair)
Prof Tom Spurling
Dr Ezio Rizzardo
Prof Margaret Sheil
Mr Nigel Poole

### Expert Panel

Prof Tom Spurling (Chair)
Dr Ezio Rizzardo
Dr Oliver Mayo
Prof Elaine Sadler
Dr Trevor Powell

### Undergraduate Degree Panel

Prof Margaret Sheil (Chair)
Prof David Symington
Dr Terry Lyons

I would also like to acknowledge the work of our reviewers, who generously donate their time to assessing proposals, reviewing progress of projects and providing expert advice to SIEF.

Science is an incremental endeavour. The true value of project outcomes may take years or decades to become clear. It has been a privilege to act as custodian of SIEF over the past five years and I look forward to seeing the fruits of this investment in coming years. SIEF's enduring legacy will be converting the proceeds of an invention of profound global impact into the globally significant science of the future.

**Dr Megan Clark**
Trustee SIEF

Australian National
Audit Office

**INDEPENDENT AUDITOR'S REPORT**

**To the Trustee of the Science and Industry Endowment Fund**

I have audited the accompanying financial report of the Science and Industry Endowment Fund for the year ended 30 June 2014, which comprises: a Statement by Trustee and Chief Finance Officer of CSIRO as Service Provider to the Science and Industry Endowment Fund; Statement of Comprehensive Income; Statement of Financial Position; Statement of Changes in Equity; Cash Flow Statement; and Notes to and forming part of the Financial Report including a Summary of Significant Accounting Policies.

***Trustee's Responsibility for the Financial Report***

The Trustee of the Science and Industry Endowment Fund is responsible for the preparation of the financial report that gives a true and fair view in accordance with Australian Accounting Standards (including Australian Accounting Interpretations), and for such internal control as is necessary to enable the preparation of the financial report that give a true and fair view and are free from material misstatement, whether due to fraud or error.

***Auditor's Responsibility***

My responsibility is to express an opinion on the financial report based on my audit. I have conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. These auditing standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance about whether the financial report is free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial report. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial report, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Science and Industry Endowment Fund's preparation of the financial report that gives a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Science and Industry Endowment Fund's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made by the Trustee as well as evaluating the overall presentation of the financial report.

GPO Box 707 CANBERRA ACT 2601
19 National Circuit BARTON ACT 2600
Phone (02) 6203 7300 Fax (02) 6203 7777

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

***Independence***

In conducting my audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the requirements of the Australian accounting profession.

***Opinion***

In my opinion, the financial report of the Science and Industry Endowment Fund:

(a) has been prepared in accordance with Australian Accounting Standards (including Australian Accounting Interpretations); and

(b) gives a true and fair view of the Science and Industry Endowment Fund's financial position as at 30 June 2014 and of its financial performance and cash flows for the year then ended.

Australian National Audit Office

Puspa Dash
Executive Director

Delegate of the Auditor-General

Canberra
21 August 2014

**SCIENCE AND INDUSTRY ENDOWMENT FUND**

**STATEMENT BY TRUSTEE AND CHIEF FINANCE OFFICER OF CSIRO AS SERVICE PROVIDER TO THE SCIENCE AND INDUSTRY ENDOWMENT FUND**

In our opinion, the attached financial report for the year ended 30 June 2014 has been prepared based on properly maintained financial records and in accordance with Australian Accounting Standards and other mandatory financial reporting requirements in Australia, and give a true and fair view of the financial position of the Fund as at 30 June 2014 and of its performance for the year then ended.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Fund will be able to pay its debts as and when they become due and payable.

**Megan Clark**

Trustee of the Science and Industry Endowment Fund

21 August 2014

**Hazel Bennett**

Chief Finance Officer of CSIRO as service provider to the Science and Industry Endowment Fund

21 August 2014

**SCIENCE AND INDUSTRY ENDOWMENT FUND**
**STATEMENT OF COMPREHENSIVE INCOME**
**For the period ended 30 June 2014**

| | Notes | 2014 $ | 2013 $ |
|---|---|---|---|
| **EXPENSES** | | | |
| Scientific research grants | 5 | 23,162,983 | 25,659,369 |
| Service fee under Services Agreement with CSIRO | | 474,318 | 466,090 |
| Audit fees | | 7,900 | 7,000 |
| Advertising and approval fees | 6 | 5,226 | 4,873 |
| Other fees | | 64 | 9,148 |
| **Total expenses** | | **23,650,491** | **26,146,480** |
| | | | |
| **LESS:** | | | |
| **REVENUE** | | | |
| Scientific grant program refunds | | 22,963 | - |
| Interest | | 4,442,879 | 6,540,473 |
| Resources received free of charge | 6 | 5,226 | 4,873 |
| **Total revenue** | | **4,471,068** | **6,545,346** |
| | | | |
| **Net deficit** | | **(19,179,423)** | **(19,601,134)** |
| | | | |
| **Other comprehensive income** | | - | - |
| | | | |
| **Total comprehensive loss** | | **(19,179,423)** | **(19,601,134)** |

The above statement should be read in conjunction with the accompanying notes.

**SCIENCE AND INDUSTRY ENDOWMENT FUND**
**STATEMENT OF FINANCIAL POSITION**
**As at 30 June 2014**

| | Notes | 2014 | 2013 |
|---|---|---|---|
| | | $ | $ |
| **ASSETS** | | | |
| Cash | 7 | 102,505,972 | 121,612,429 |
| Interest receivable | 8 | 742,562 | 1,438,235 |
| GST receivable | | 576,643 | 1,350,269 |
| Other receivables | 8 | 19,184 | - |
| **TOTAL ASSETS** | | **103,844,361** | **124,400,933** |
| | | | |
| **LIABILITIES** | | | |
| **Payables** | | | |
| Creditors | | 1,947,492 | 2,937,997 |
| Accrued expenses | 9 | 155,883 | 542,527 |
| **Total payables** | | **2,103,375** | **3,480,524** |
| | | | |
| **TOTAL LIABILITIES** | | **2,103,375** | **3,480,524** |
| | | | |
| **NET ASSETS** | | **101,740,986** | **120,920,409** |
| | | | |
| **EQUITY** | | | |
| Contributed equity | | 200,000 | 200,000 |
| Retained surplus | | 101,540,986 | 120,720,409 |
| | | | |
| **TOTAL EQUITY** | | **101,740,986** | **120,920,409** |

The above statement should be read in conjunction with the accompanying notes.

**SCIENCE AND INDUSTRY ENDOWMENT FUND**

**STATEMENT OF CHANGES IN EQUITY**

**For the period ended 30 June 2014**

| | Retained Surplus | | Contributed Equity | | Total Equity | |
|---|---|---|---|---|---|---|
| | 2014 $ | 2013 $ | 2014 $ | 2013 $ | 2014 $ | 2013 $ |
| **Balance as at 1 July** | **120,720,409** | **140,321,543** | **200,000** | **200,000** | **120,920,409** | **140,521,543** |
| Net deficit | (19,179,423) | (19,601,134) | - | - | **(19,179,423)** | **(19,601,134)** |
| **Closing balance at 30 June** | **101,540,986** | **120,720,409** | **200,000** | **200,000** | **101,740,986** | **120,920,409** |

The above statement should be read in conjunction with the accompanying notes.

**SCIENCE AND INDUSTRY ENDOWMENT FUND**
**CASH FLOW STATEMENT**
**For the period ended 30 June 2014**

| | Notes | 2014 $ | 2013 $ |
|---|---|---|---|
| **OPERATING ACTIVITIES** | | | |
| **Cash received** | | | |
| Scientific research grant refunds | | 3,780 | - |
| Interest received | | 5,138,553 | 6,679,815 |
| Net GST received | | 3,165,145 | 1,572,687 |
| **Total cash received** | | **8,307,478** | **8,252,502** |
| | | | |
| **Cash used** | | | |
| Payments to grantees | | 26,872,028 | 26,828,181 |
| Other payments | | 541,845 | 517,158 |
| Bank fees paid | | 62 | 62 |
| **Total cash used** | | **27,413,935** | **27,345,401** |
| **Net cash provided/(used) by operating activities** | 10 | **(19,106,457)** | **(19,092,899)** |
| | | | |
| Net increase/(decrease) in cash held | | (19,106,457) | (19,092,899) |
| | | | |
| Cash at the beginning of the reporting period | | 121,612,429 | 140,705,328 |
| | | | |
| **Cash at the end of the reporting period** | | **102,505,972** | **121,612,429** |

The above statement should be read in conjunction with the accompanying notes.

**SCIENCE AND INDUSTRY ENDOWMENT FUND**

**NOTES TO AND FORMING PART OF THE FINANCIAL REPORT**

**For the period ended 30 June 2014**

## Note 1 Summary of Significant Accounting Policies

### 1.1 Basis of Preparation of the Financial Report

The financial report for the Science and Industry Endowment Fund (referred to as the 'Fund') is required by section 10 of the Science and Industry Endowment Act 1926 and has been prepared in accordance with Australian Accounting Standards, Australian Accounting Interpretations, and other authoritative pronouncements of the Australian Accounting Standards Board.

The financial report has been prepared on an accrual basis and is in accordance with the historical cost convention. No allowance is made for the effect of changing prices on the results or the financial position.

Assets and liabilities are recognised in the Statement of Financial Position when, and only when, it is probable that future economic benefits will flow and the amounts of the assets or liabilities can be reliably measured.

Revenues and expenses are recognised in the Statement of Comprehensive Income when, and only when, the flow or consumption or loss of economic benefits has occurred and can be reliably measured.

The financial report is presented in Australian Dollars and values are rounded to the nearest dollar unless otherwise specified.

### 1.2 Cash

For the purpose of the Cash Flow Statement, cash includes cash at bank and deposits at call. They are readily convertible to cash.

### 1.3 Revenue

Interest revenue is recognised using the effective interest method as set out in AASB 139 *Financial Instruments: Recognition and Measurement* .

### 1.4 Resources Received Free of Charge

Services received free of charge are recognised as gains when and only when a fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of those resources is recognised as an expense.

### 1.5 Financial Instruments

Accounting policies for financial instruments are stated in Note 11.

### 1.6 Taxation

The Fund is exempted from all forms of taxation except the GST.

### 1.7 Events after the Reporting Period

At the time of completion of this note, the Trustee is not aware of any significant events occurring after the reporting date that could impact on the financial report.

### 1.8 Grant Payments

Scientific research grants are normally paid inclusive of the GST.

## Note 2 Principal Activity

The Fund was established under the Science and Industry Endowment Act 1926 with the Trustee of the Fund being the CSIRO Chief Executive. An appropriation of 100 000 pounds was received at the time the Fund was established. The funds were invested and have subsequently earned interest over time.

The principal activity of the Fund is to provide assistance to persons engaged in scientific research and in the training of students in scientific research.

**Gift made in October 2009**

In October 2009, Senator Carr announced a gift of $150 million to be donated by CSIRO to the Fund. The gift is intended to be used for scientific research for the purposes of assisting Australian industry, furthering the interests of the Australian community or contributing to the achievement of Australian national objectives. The gift was made subject to the terms of a Deed of Gift between the Trustee and CSIRO dated 15 October 2009.

$100 million was received in financial year 2009–10. The final instalment of $50 million was received in financial year 2010–11.

The maximum amount to be disbursed from the Gift Fund in any one financial year does not exceed $25 million (GST exclusive)

**Note 3 Schedule of Commitments**

| | 2014 | 2013 |
|---|---|---|
| | $ | $ |
| **BY TYPE** | | |
| Grants payable | 40,688,118 | 54,990,428 |
| **Total grants payable** | **40,688,118** | **54,990,428** |
| | | |
| **BY MATURITY** | | |
| One year or less | 18,773,257 | 19,512,086 |
| From one to five years | 21,839,061 | 35,326,742 |
| More than five years | 75,800 | 151,600 |
| **Total grants payable** | **40,688,118** | **54,990,428** |

Note: Commitments are GST exclusive.

**Note 4 Contingent Assets and Liabilities**

No contingent assets and liabilities existed as at 30 June 2014 (2013: nil).

**Note 5 Scientific research grants**

| | | |
|---|---|---|
| CREST Program awards | 38,366 | 18,529 |
| Macquarie University joint chair in Wireless Communication | 256,339 | - |
| Scholarships and Fellowships | 1,657,800 | 1,906,800 |
| Research Infrastructure Investment | 200,000 | 7,900,000 |
| Special Research Program | 6,400,000 | 2,500,000 |
| Research Project Grants | 14,610,478 | 13,334,040 |
| **Total** | **23,162,983** | **25,659,369** |

The Fund is a subsidiary entity of the Commonwealth Scientific and Industrial Research Organisation (CSIRO). For the 2013-14 financial year, the Fund has recognised $15.1m in grant expenses as transferred directly to CSIRO to support scientific research and infrastructure projects within CSIRO and/or collaborative projects with external organisations (2012-13: $11.8m).

**Note 6 Estimated value of resources provided free of charge by CSIRO are as follows:**

| | | |
|---|---|---|
| advertising and approval fees | 5,226 | 4,873 |
| **Total** | **5,226** | **4,873** |

| Note 7 | Cash | 2014 | 2013 |
|---|---|---|---|
| | | $ | $ |
| | Cash at bank | 3,026,514 | 3,391,594 |
| | Deposits – at call | 99,479,458 | 118,220,835 |
| | **Total** | **102,505,972** | **121,612,429** |

| Note 8 | Receivables | | |
|---|---|---|---|
| | Interest receivable | 742,562 | 1,438,235 |
| | Other receivables | 19,184 | - |
| | | **761,746** | **1,438,235** |
| | Gross receivables are aged as follows: | | |
| | Not overdue | 761,079 | 1,438,235 |
| | Overdue by: | | |
| | 0 to 30 days | 667 | - |
| | Total receivables (gross) | **761,746** | **1,438,235** |

| Note 9 | Accrued Expenses | | |
|---|---|---|---|
| | Service fee under Services Agreement with CSIRO | 109,617 | 120,883 |
| | CREST Program awards | 38,366 | 24,644 |
| | Research Project Grant | - | 390,000 |
| | Audit fee | 7,900 | 7,000 |
| | **Total** | **155,883** | **542,527** |

| Note 10 | Cash Flow Reconciliation | | |
|---|---|---|---|
| | Reconciliation of operating surplus to net cash from/(used by) operating activities: | | |
| | **Operating surplus/(deficit)** | (19,179,423) | (19,601,134) |
| | **Changes in assets and liabilities** | | |
| | (Increase)/decrease in receivables | 1,450,115 | (879,011) |
| | (Increase)/decrease in prepayments | - | 2,466 |
| | Increase/(decrease) in payables | (1,377,149) | 1,384,780 |
| | **Net cash from/(used by) operating activities** | **(19,106,457)** | **(19,092,899)** |

**Note 11 Financial Instruments**

| 11A: Categories of Financial Instruments | 2014 | 2013 |
|---|---|---|
| | $ | $ |
| **Financial assets** | | |
| Cash | 102,505,972 | 121,612,429 |
| Interest receivable | 742,562 | 1,438,235 |
| Other receivables | 19,184 | - |
| **Total financial assets** | **103,267,718** | **123,050,664** |
| **Financial liabilities** | | |
| Supplier payables | 2,103,375 | 3,480,524 |
| **Total financial liabilities** | **2,103,375** | **3,480,524** |

The net value of the financial assets are their carrying amounts.

**11B: Credit risk**

The Fund is exposed to minimal credit risk with its financial assets. Cash represents cash at bank and short term deposits held at reputable Australian financial institutions. Other receivables comprises of grant refunds payable to the Fund due to grant recipients discontinuing the Fund's programs, or agreement that unspent grant funding at the completion of a program is to be returned to the Fund. For the purpose of this note, GST receivables are not disclosed as financial instruments as they do not meet the definition of a financial asset. The Fund has assessed the risk of default on payment to be nil as of 30 June 2014 (2013: nil).

**11C: Liquidity risk**

The Fund's financial liabilities are supplier payables. The exposure to liquidity risk is based on the notion that the Fund will encounter difficulty in meeting its obligations associated with financial liabilities. This is highly unlikely due to funding that is in place and internal policies and procedures to ensure that there are appropriate resources to meet its financial obligations (2013: nil).

**11D: Market risk**

The Fund holds basic financial instruments that do not expose the Fund to any market, currency or other price risk (2013: nil).

**11E: Interest rate risk**

The Fund maintains an operating bank account and short term deposits which are subject to short term interest rates. Funds are maintained in term deposits for short periods. In 2013–14 the average return on cash and short term deposits was 3.98% (2013: 4.97%).

# Appendix 6 | Full list of CSIRO locations

As at 30 June 2014, CSIRO has 57 locations across Australia and overseas.

## AUSTRALIAN CAPITAL TERRITORY

Acton
Black Mountain
Campbell
Crace
Ginninderra
Tidbinbilla
Yarralumla

## QUEENSLAND

Atherton
Bribie Island
Brisbane
- Coopers Plains
- Dutton Park
- Herston
- Pullenvale
- St Lucia

Cairns
Gatton
Toowoomba
Townsville
- Woodstock
- Townsville Australian Tropical Science and Innovation Precinct

## NEW SOUTH WALES

Armidale
- Arding (site disposed in August 2014)
- Chiswick

Griffith
Mopra
Myall Vale
Narrabri
Newcastle
Parkes
Sydney
- North Ryde
- Lindfield
- Marsfield
- Lucas Heights

## NORTHERN TERRITORY

Alice Springs
Darwin

## SOUTH AUSTRALIA

Adelaide
- Kintore Avenue
- Waite Campus
- South Australian Health and Medical Research Institute

## TASMANIA

Hobart
Sandy Bay

## VICTORIA

Geelong
- Australian Animal Health Laboratory
- Belmont
- Waurn Ponds

Irymple
Melbourne
- Aspendale
- Clayton
- Collingwood
- Highett
- Parkville

Werribee
- Sneydes Road
- South Road

Wodonga

## WESTERN AUSTRALIA

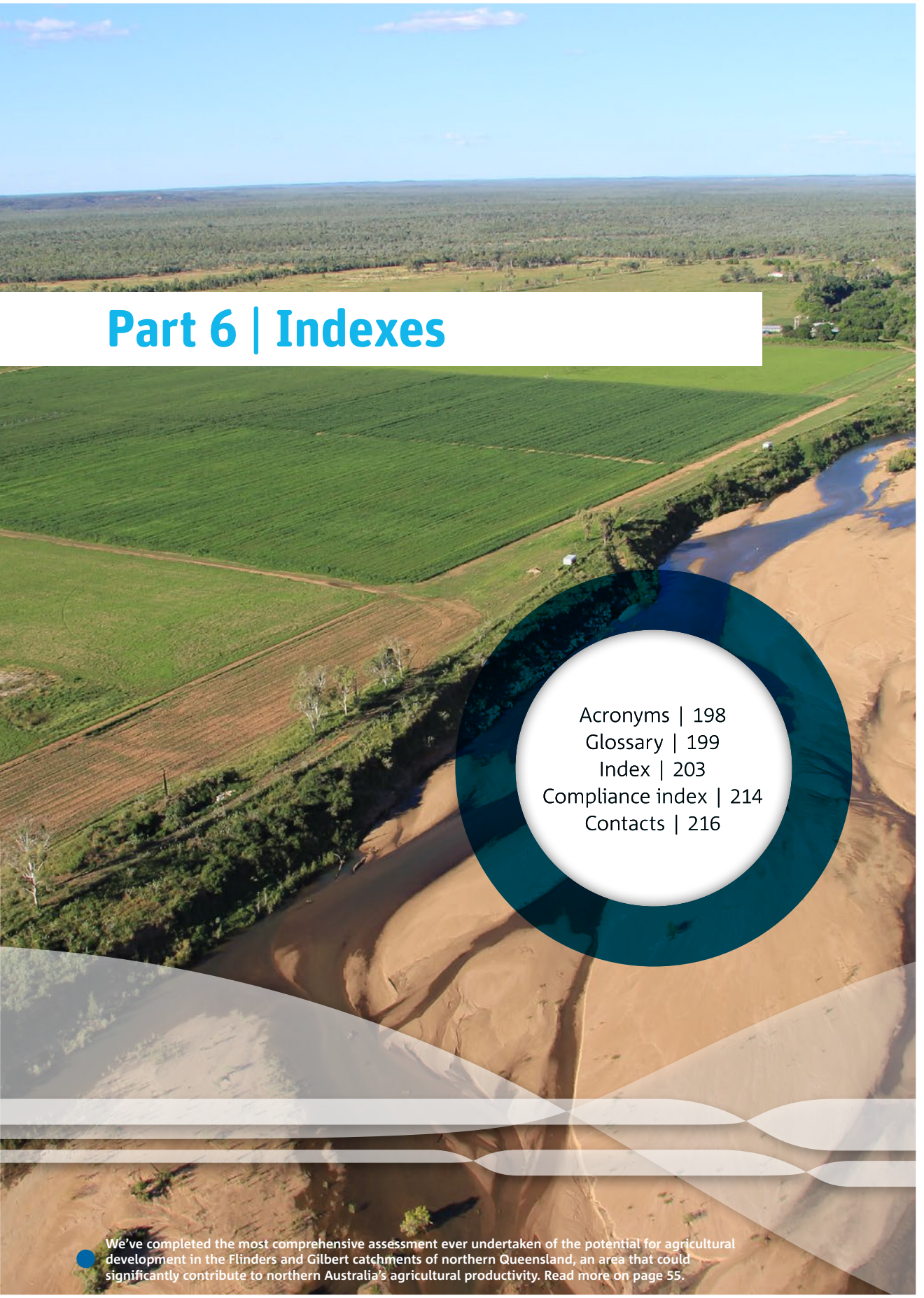
Geraldton
Murchison
Perth
- Floreat
- Kensington
- Waterford

## INTERNATIONAL

France
- Montpellier

Chile
- Santiago

# Part 6 | Indexes





We've completed the most comprehensive assessment ever undertaken of the potential for agricultural development in the Flinders and Gilbert catchments of northern Queensland, an area that could significantly contribute to northern Australia's agricultural productivity. Read more on page 55.

## Acronyms

| | |
|---|---|
| AAHL | Australian Animal Health Laboratory |
| ACIAR | Australian Centre for International Agricultural Research |
| ACT | Australian Capital Territory |
| ADJR Act | *Administrative Decisions (Judicial Review) Act 1977* |
| AGP | Australian Growth Partnership |
| ALA | *Atlas of Living Australia* |
| AMSA | Australian Maritime Safety Authority |
| ANIC | Australian National Insect Collection |
| ANFC | Australian National Fish Collection |
| ANH | Australian National Herbarium |
| ANU | Australian National University |
| ANWC | Australian National Wildlife Collection |
| APS | Australian Public Service |
| ASKAP | Australian Square Kilometre Array Pathfinder |
| ATNF | Australia Telescope National Facility |
| CAC Act | *Commonwealth Authorities and Companies Act 1997* |
| CAFHS | CSIRO Animal, Food and Health Sciences |
| CDSCC | Canberra Deep Space Communication Complex |
| CES | CSIRO Ecosystem Sciences |
| CLW | CSIRO Land and Water |
| CMSE | CSIRO Materials Science and Engineering |
| $CO_2$ | Carbon dioxide |
| CPI | CSIRO Plant Industry |
| CPRs | Commonwealth Procurement Rules |
| CRC | Cooperative Research Centre |
| CREST | CREativity in Science and Technology |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| DICE | Direct Injection Carbon Engine |
| DHS | Department of Human Services |
| ESM | Enterprise Strategy Measure |
| FGARA | Flinders and Gilbert Agricultural Resource Assessment |
| FMF | Future Manufacturing Flagship |
| FOI Act | *Freedom of Information Act 1982* |
| FTE | Full-Time Equivalent |
| GAA | Gamma-activation analysis |
| HSE | Health, Safety and Environment |
| HVAC | Heating, ventilation and air-conditioning |
| ICT | Information and Communication Technology |
| IP | Intellectual Property |
| KEA | Key Executive Action |
| KPIs | Key Performance Indicators |
| LTIFR | Lost Time Injury Frequency Rate |
| MDI | Medical Developments International |
| MDU | Minerals Down Under Flagship |
| MECSM | Microbially enhanced coal seam gas |
| MISA | Marine Innovation Southern Australia |
| MNF | Marine National Facility |
| MTFIR | Medical Treatment Injury Frequency Rate |
| NCRIS | National Collaborative Research Infrastructure Strategy |
| NRM | Natural resource management |
| NSW | New South Wales |
| P-Health | Preventative Health Flagship |
| PBS | Portfolio Budget Statements |
| PCT | Patent Cooperation Treaty |
| PED | Porcine Epidemic Diarrhoea |
| PID Act | *Public Interest Disclosure Act 2013* |
| PNG | Papua New Guinea |
| R&D | Research and development |
| RAFT | Reversible Addition Fragmentation chain Transfer |
| SARS-CoV | Severe Acute Respiratory Syndrome coronavirus |
| SIEF | Science and Industry Endowment Fund |
| SIR Act | *Science and Industry Research Act 1949* |
| SESKA | Sustainable Energy for the Square Kilometre Array |
| SMEs | Small-to-medium enterprises |
| SMiS | Scientists and Mathematicians in Schools |
| UBI | Universal Biosensors Inc. |
| UK | United Kingdom |
| USA | United States of America |
| WASP | Wireless Ad hoc System for Positioning |
| WfHC | Water for a Health Country Flagship |
| WHS Act | *Work Health and Safety Act 2011* |
| WLAN | Wireless Local Area Networks |

# Glossary

**Books and chapters**: Includes monographs, complete or individual chapters, usually published by a commercial publisher.

**Conference papers**: Includes published conference papers and edited proceedings.

**Divisional Capability Review Terms of Reference:** The assessment criteria for the Divisional Review Panel to assess the performance of a Capability Division within CSIRO includes:

**1. Quality of the science directed at objectives:**

| | |
|---|---|
| Benchmark | Sustained scientific leader – well recognised in the international research community for this. |
| Strong | Able to set and sustain new scientific/technical directions within the international research community. |
| Favourable | Able to maintain a good position in the international research community 'pack'; not a scientific leader except in niches outside mainstream areas. |
| Tenable | Not able to set or sustain independent scientific/technical directions – a sense of being continually a follower. |
| Weak | Declining quality of scientific/technical output compared with other research groups. Often a short-term 'fire-fighting' focus. |

**2. Probable impact on end-user partners:**

| | |
|---|---|
| Benchmark | The research results are such that they are used to set the pace and direction of commercial, environmental, community or policy development – recognised in industry or the community for this. |
| Strong | The research results are such that they enable commercial, environmental, community or policy development that distinguishes user organisations from peers or competitors. |
| Favourable | The research results are such that they enable commercial, environmental, community or policy development that organisations use to improve their position relative to peers or competitors. |
| Tenable | The research results are such that they are used by organisations for commercial, environmental, community or policy development that maintains, but does not improve, their position relative to peers or competitors. |
| Weak | The research results are such that they are not able to be used by organisations to even maintain their position relative to peers or competitors. |

**Enterprise Strategy Measures:** ESMs are designed to provide evidence of our performance in four dimensions that are critical to the success of CSIRO's Strategy 2011–15.

**Epigenetics changes:** Epigenetic changes are changes, usually chemical modifications, of DNA or its associated chromosomal proteins that do not alter the actual sequence of the DNA but that can be inherited through cell divisions and sometimes across generations. These epigenetic modifications control the way in which genes are switched on or off, can persist throughout life and can be influenced by a number of different factors including the environment, stress, diet, behaviour and toxins.

**Flagship Review Terms of Reference:** The assessment criteria for a Flagship Review Panel to assess the performance of a Flagship includes:

**1. Quality of the science directed at Flagship objectives:**

| | |
|---|---|
| Benchmark | Sustained scientific leader – well recognised in the international research community for this. |
| Strong | Able to set and sustain new scientific/technical directions within the international research community. |
| Favourable | Able to maintain a good position in the international research community 'pack'; not a scientific leader except in niches outside mainstream areas. |
| Tenable | Not able to set or sustain independent scientific/technical directions – a sense of being continually a follower. |
| Weak | Declining quality of scientific/technical output compared with other research groups. Often a short-term 'fire-fighting' focus. |

**2. Probable impact on end-user partners:**

| | |
|---|---|
| Benchmark | The research results are such that they are used to set the pace and direction of commercial, environmental, community or policy development – recognised in industry or the community for this. The Flagship is on track to achieve and exceed the goals necessary for the declared outcome. |
| Strong | The research results are such that they enable commercial, environmental, community or policy development that distinguishes user organisations from peers or competitors. The Flagship is on track to meet its timelines and milestones toward output goals. |
| Favourable | The research results are such that they enable commercial, environmental, community or policy development that organisations use to improve their position relative to peers or competitors. The Flagship will contribute outputs on the path to cited goals. |
| Tenable | The research results are such that they are used by organisations for commercial, environmental, community or policy development that maintains, but does not improve, their position relative to peers or competitors. The Flagship will make contributions towards meeting its milestone and output timelines. |
| Weak | The research results are such that they are not able to be used by organisations to even maintain their position relative to peers or competitors. The Flagship will not significantly advance Australia toward meeting the national challenge. |

**Granted patents**: Once a patent application has been examined and satisfies various patentability criteria it becomes a granted patent. It remains a granted patent until the end of the patent period (normally 20 years) provided renewal fees are paid.

**Inventions**: This is the number of inventions where one or more patent/applications are current. Accordingly an invention might include a granted patent that is near the end of its life (for example, 20 years), or it might include a provisional patent application that has only recently been filed. Furthermore, one invention might relate to a patent application in one country only, or it might relate to over 20 patents/applications in different countries covering the one invention.

**Journal articles**: Includes journal articles and other items published as part of a journal (for example, an editorial or book review).

**Key Executive Actions:** KEAs are designed to focus the Board and the Executive Team's attention on the most important priorities of the Organisation.

**Live patent cases**: A live patent case is where either a patent application or a granted patent exists. It does not include cases that have lapsed, expired or been withdrawn. Applications may include provisional applications, Patent Cooperation Treaty (PCT) applications and applications pending in Australia or foreign jurisdictions.

**New inventions**: This is the number of new inventions where an application (normally an Australian provisional application) is filed for the first time to protect that invention. A major implication of filing that provisional application is that it provides the applicant with an internationally recognised priority date. A small percentage of CSIRO's new inventions are filed as US provisional applications.

**PCT applications**: International PCT applications are a 'temporary' phase in any international patenting process and these have a life span of 18 months. This type of application is very common in major international corporations and is used by CSIRO when it considers its invention may have wide commercial application. In view of the 18-month time span, it is reasonable to approximate that two-thirds of the reported number were filed in the previous 12-month period.

**Science excellence:** An assessment of the competitiveness of CSIRO's research capabilities. It recognises CSIRO's science (for example, total citations) and excellence (for example, citation rates). It tends to be output orientated and includes lagging metrics relating to research publication performance (bibliometrics), esteem measures, such as awards and expert-peer reviews.

**Science health:** An assessment of the sustainability and vitality of research capabilities. It is a useful analysis in addition to 'excellence', in that it enables a focus on the likely future performance of capabilities. The set of metrics used to assess health is broader and more input focused than those used to assess excellence. It includes research staff mix, funding and connections with other institutions, including collaborations with other research organisations, as well as the broader innovation system.

**Sponsored students**: Students are deemed to be sponsored if they receive a full or partial scholarship paid from CSIRO funds to pursue a research project leading to a PhD or Honours/Masters degree. This excludes CSIRO employees, whose study expenses are considered to be 'training and development'.

**Supervised students**: Students are deemed to be supervised if they have a CSIRO staff member appointed officially by the University as the supervisor for their research project. Normally, CSIRO staff are joint supervisors in conjunction with a university academic.

**Technical reports**: Includes individually authored chapters as well as whole reports that are subject to peer review and usually publicly released.

**Technological output:** An assessment of the Organisation's excellence in delivering relevant research results to its users. This involves working on the right problems, doing projects well and excellence in transferring our research results. One metric for this, given this context, is CSIRO's patenting activity, as this provides an understanding of its technological output and potential impact.

**Twenty (20) global peers:** Applied science research organisations from around the world that are comparable to CSIRO include:

| ABBREVIATION | NAME | COUNTRY |
|---|---|---|
| A*STAR | Agency for Science, Technology and Research *** | Singapore |
| Battelle | Battelle Memorial Institute | United States |
| BNL | Brookhaven National Laboratory (commercialisation activity through Brookhaven Science Associates) | United States |
| CAS | Chinese Academy of Sciences (formerly Academia Sinica) | China |
| CSIR India | Council for Scientific and Industrial Research (India) | India |
| CSIR SA | Council for Scientific and Industrial Research (South Africa)** | South Africa |
| DTI | Danish Technological Institute (Teknologisk Institut er Danmarks)** | Denmark |
| TNO | Dutch Organization for Applied Scientific Research (Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek) | Netherland |
| ETRI | Electronics and Telecommunications Research Institute | Korea |
| Fraunhofer | Fraunhofer-Gesellschaft | Germany |
| CNRS | French National Centre for Scientific Research (Centre National de la Recherche Scientifique) | France |
| Helmholtz | Helmholtz Germany | Germany |
| ITRI | Industrial Technology Research Institute | Taiwan |
| INRA | Institut National de la Recherche Agronomique | France |
| JST | Japan Science and Technology Agency *** | Japan |
| NRC | National Research Council | Canada |
| AIST | National Institute of Advanced Industrial Science and Technology | Japan |
| SIRIM | SIRIM Berhad (formerly Standards and Industrial Research Institute of Malaysia)** | Malaysia |
| SP | SP Technical Research Institute of Sweden (SP Sveriges Tekniska Forskningsinstitut)** | Sweden |
| VTT | VTT Technical Research Centre of Finland (Teknologian Tutkimuskeskus VTT) | Finland |

Note: Due to data limitations some agencies could not be included in the analysis for different measures. Please refer to the following notes for more information:

* indicates that the organisations were not included in the impact citation analysis
** indicates that the organisations were not included in the intellectual property analysis
*** indicates that the organisation was not included in both the impact citation and intellectual property analyses

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## Compliance index: statutory reporting requirements

The index below shows compliance with information requirements contained in the *Commonwealth Authorities and Companies Act 1997* (CAC Act), in particular Part 2 of the *Commonwealth Authorities (Annual Reporting) Orders 2011* and the *Science and Industry Research Act 1949* (SIR Act). This annual report complies with Parliamentary standards of presentation and printing, and uses plain English and clear design.

| | SOURCE | PAGE |
|---|---|---|
| **CAC Act** | | |
| The annual report includes a report of operations prepared by the directors in accordance with the Finance Minister's Orders. | Schedule 1 Clause 1(a) | 1-114 |
| The annual report includes financial statements prepared by the directors under Clause 2 of Schedule 1. | Schedule 1 Clause 1(b) | 118–176<br>187–195 |
| The annual report includes the Auditor-General's report on the financial statements. | Schedule 1 Clause 1(c) | 116–117<br>185–186 |
| **Finance Minister's *Commonwealth Authorities (Annual Reporting) Orders 2011*** | | |
| The annual report of Operations is approved by a resolution of directors, is signed by a director and includes details of how and when approval was given. | Clause 6 | iv |
| The annual report states that directors are responsible for the preparation and contents of the Annual Report of Operations (as required in Section 9 of the CAC Act and in accordance with the Finance Minister's Orders). | | iv |
| The annual report complies with Parliamentary standards of presentation and printing. | Clause 8 | 214 |
| The annual report uses plain English and clear design. | Clause 9 | 214 |
| Enabling legislation is specified, including a summary of its objectives and functions, as specified in its legislation. | Clause 10 | 98 |
| The responsible Minister is specified. | Clause 11 | 98 |
| The annual report provides details of any Ministerial directions, etc issued and requirements of other relevant legislation, including the: | Clause 12 | |
| • *Environment Protection and Biodiversity Conservation Act 1999* | | 107, 108 |
| • *Freedom of Information Act 1982* | | 178 |
| • *Equal Employment Opportunity (Commonwealth Authorities) Act 1997* | | 109 |
| • *Workplace Health and Safety Act 2011* | | 104 |
| • *Privacy Act 1988* | | 179 |
| • *Public Interest Disclosure Act 2013* | | 179 |
| Information about directors is provided, including names, qualifications, experience, attendance at Board meetings and whether the director is an executive or non-executive member. | Clause 13 | 166–170 |
| The annual report provides an outline of: | Clause 14 | |
| a. the organisational structure (including subsidiaries) | | 10–11 |
| b. the location of major activities and facilities and provides a statement on governance practices, including details on: | | 9, 196 |
| a. board committees and their responsibilities | | 99 |
| b. education and performance review processes for directors | | 99–100 |
| c. ethics and risk management policies. | | 100–101 |

| | SOURCE | PAGE |
|---|---|---|
| The annual report discloses the decision-making process undertaken by the Board in relation to transactions with other entities. | Clause 15 | 99 |
| The annual report details any key activities and changes that affected the operations or structure, which may include: | Clause 16 | |
| a. significant events, such as forming or participating in the formation of a company, partnership etc. | | 98 |
| b. operational and financial results | | 17 |
| c. key changes to its status of affairs or principal activities | | iv |
| d. amendments to enabling legislation or any other legislation directly relevant to its operation. | | 98 |
| The annual report includes particulars of: | Clause 17 | |
| a. judicial reviews and decisions of tribunals that have had or may have a significant effect on its operations | | 101 |
| b. reports about the authority made by the Auditor-General, a Parliamentary committee, the Commonwealth Ombudsman, or the Office of the Australian Information Commissioner. | | 101, 179 |
| The annual report includes an explanation if information is missing from a subsidiary that is required to be included in the annual report. | Clause 18 | n/a |
| The annual report includes details of any indemnity given to an officer against a liability, including premiums paid, or agreed to be paid, for insurance against the officer's liability for legal costs. | Clause 19 | 100 |
| The annual report satisfies disclosure requirements for Government Business Enterprises. | Clause 20 | n/a |
| The annual report provides an index of annual report requirements identifying where relevant information can be found in the annual report. | Clause 21 | 214 |
| **SIR Act** | | |
| Policies relating to scientific research | Act No. 84, Section 46, 51 (2a) | 100–101 |
| Development in policies during the year | Act No. 84, Section 46, 51 (2b) | 101 |
| Ministerial determinations in relation to the functions of the Organisation | Act No. 84, Section 46, 51 (2c) | 98 |
| Ministerial directions or guidelines relating to the functions and powers of the Board | Act No. 84, Section 46, 51 (2d) | 98 |
| Policies of Australian Government that apply to CSIRO | Act No. 84, Section 46, 51 (2e) | 98 |
| **Other reporting requirements** | | |
| Fraud control | | 101 |
| Intellectual property management | | 59 |
| Service Charter | | 178 |

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### FEEDBACK

CSIRO welcomes your feedback on our performance. Please contact the CSIRO officer with whom you have been dealing or CSIRO Enquiries who can direct your feedback to the relevant person:

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ISSN 1030-4215
Printed in Australia by New Millenium Print.

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We do this by using science to solve real issues. Our research has a positive impact on industry, people and the planet.

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