www.csiro.au

Annual Report 2012–13

CSIRO

CSIRO – the Commonwealth Scientific and Industrial Research Organisation – is one of the largest and most diverse scientific organisations in the world. It has over 6,400 staff located across 54 sites throughout Australia and one overseas.

OUR PURPOSE

CSIRO's 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.

OUR MISSION

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

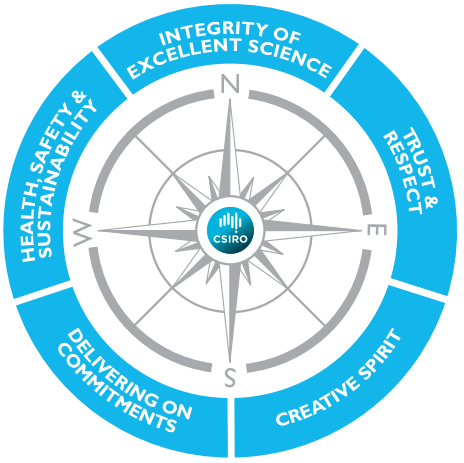
OUR VISION

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

CSIRO'S VALUES COMPASS

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.



Cover: Four billion devices worldwide use the CSIRO technology that underpins current high-speed wireless local area networks (WLANs).

www.csiro.au

CSIRO Head Office
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PO Box 225, Dickson, ACT 2602, Australia
T (02) 6276 6000 • **ABN** 41 687 119 230

2 October 2013

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

We have pleasure in submitting to you, for presentation to Parliament, the sixty-fifth Annual Report of the Commonwealth Scientific and Industrial Research Organisation (CSIRO). This report has been prepared in accordance with the requirements of the *Science and Industry Research Act 1949* 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.

This report presents fairly the information required by the Minister for Finance and Deregulation as set out in the *Commonwealth Authorities (Annual Reporting) Orders 2011*.

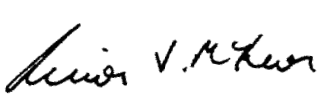
The report has been approved for presentation to you, signed this 22nd day of August 2013 in accordance with a resolution of the Board members.

The report 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. In February 2013, CSIRO commissioned former Commonwealth Ombudsman Professor Dennis Pearce, and the legal firm HWL Ebsworth, to conduct an independent review of allegations by current or former staff or their agents regarding their treatment while with the CSIRO. Professor Pearce provided his report to CSIRO on 31 July 2013, and CSIRO has accepted all its recommendations.

On 1 July 2013, CSIRO merged its Energy Transformed Flagship and Advanced Coal Technology and Petroleum and Geothermal Research portfolios to create the new Energy Flagship. Also on this day a new Division of Computational Informatics was formed with the merger of our Mathematics, Informatics and Statistics, and Information and Communication Technology Divisions.

We commend the Organisation's achievements to you.



Simon McKeon AO
Chairman of the Board

Megan Clark
Chief Executive

OUR HISTORY

The Council for Scientific and Industrial Research (CSIR) was established in 1926 with its primary research devoted towards agriculture. In the late 1930s this was extended to include industrial research.

In 1949, the CSIR was reconstituted as CSIRO, and gradually expanded its activities so that its research was related to almost every field of primary, secondary and tertiary industry in Australia.

Today, CSIRO is a trusted source of creative ideas and practical technologies to deliver impact for the nation.

FURTHER INFORMATION

Please visit our website for more details: www.csiro.au

This report covers the financial year ended 30 June 2013. It is also available on our website as a downloadable PDF **www.csiro.au/annualreport1213**

CONTENTS

COTTON • **TRANSFORMING THE COTTON INDUSTRY FOR COMPETITIVE RESULTS**

More than 95 per cent of Australia's cotton crop is based on CSIRO varieties; using 85 per cent less insecticide and 52 per cent less herbicide.

PART ONE
OVERVIEW

HIGHLIGHTS OF 2012–13

CSIRO is Australia's national science organisation. We are one of the largest and most diverse scientific organisations in the world. This report highlights a wide array of our recent science and its applications. Here are just a few examples of the impact CSIRO has on our lives, our industries and our environment.

On 1 November 2012, Australian horse owners and the equine industry received an important boost in their fight against the deadly Hendra virus with the introduction of Equivac® HeV vaccine.

Scientists at CSIRO's Australian Animal Health Laboratory (AAHL), working in close partnership with Zoetis Australia (formerly Pfizer Animal Health) and two organisations from the USA (the Uniformed Service University of the Health Sciences and the Henry M Jackson Foundation for the Advancement of Military Medicine) played a critical role in developing the Equivac® HeV vaccine. This vaccine is the first commercial vaccine for a Bio-Safety Level-4 disease agent, the most dangerous disease agents in the world. AAHL is the only laboratory in the world equipped for this type of large-animal research (more on page 23).

CSIRO and partners are developing a blood-based screening test for the early detection of Alzheimer's disease. One quarter of a million Australians currently suffer from dementia and given our ageing population, it is predicted that this will increase to one million by 2050, with Alzheimer's accounting for 50–70 per cent of dementia cases. If Alzheimer's can be detected early, new treatments could be developed and prescribed to slow the progression of the disease before irreversible brain damage has occurred (more on page 37). Image: iStock Photo

Storm surge inundation caused by extreme weather conditions varies greatly both within and between coastal communities. It is a significant risk in south-east Queensland where 200,000 people would be at risk from a one-in-100-year storm tide. This risk increases as the population grows and sea levels rise. If coastal communities are to protect themselves against these current and future risks they need to adapt and make decisions about how to manage coastal inundation.

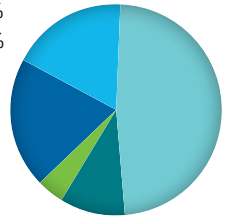
To address these challenges, CSIRO researchers produced a model of the costs and potential benefits of a range of adaptation options that could improve some or all of the effects of coastal inundation events (more on page 25).

FINANCIAL PERFORMANCE 2012–13

CSIRO's financial result for 2012–13 was a deficit of $21.5 million. Total revenue for the year was $1,246 million and total expenses were $1,267.5 million. CSIRO's financial performance for 2012–13 is summarised in Table 2.1 on page 3.

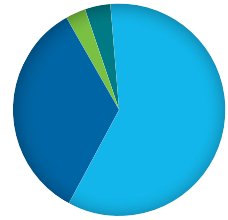
Sources of CSIRO revenue in 2012–13

- Australian private sector: 18%
- Australian Governments: 48%
- Rural industry R&D corporations: 10%
- Cooperative Research Centres: 4%
- Overseas entities and international: 20%



Sources of research and services revenue in 2012–13

- Total co-investment: 34%
- Intellectual property: 3%
- Other: 4%
- Revenue from Government: 59%



The Energy Transformed Flagship has invested in the largest solar thermal power research capability in the southern hemisphere and is currently delivering more than $150 million worth of solar thermal projects for industry and government, in collaboration with some of the leading companies, universities and research agencies in the world (more on page 29).

Textor Technologies is a Victorian, family-owned company producing an array of products used in healthcare, personal hygiene and industrial products. The hygiene product market is a highly competitive, multi-billion dollar consumer-focused industry.

Every year in Australia 300,000 babies enter the $500 million nappy market with over 40 per cent born to first-time mums. Working with Textor Technologies and multinational Kimberly-Clark, CSIRO helped develop a new three dimensional (3D) material that increases nappy absorbency. CSIRO's involvement with Textor has helped to improve their manufacturing processes by applying smart technology to improve efficiency, which has contributed to a significant increase in their annual gross turn over (more on page 33).

Hospital emergency departments are often critically overcrowded and struggle to respond to day-to-day arrivals in a timely manner. To assist hospitals with this challenging issue, researchers from CSIRO's Digital Productivity and Services Flagship developed the Patient Admission Prediction Tool (PAPT), a software tool that uses historical data to predict, with around 90 per cent accuracy, how many patients will arrive at emergency departments and when. PAPT also predicts a patient's medical needs and urgency of care and how many patients will be admitted or discharged. It has the potential to save $23 million per annum in improved service efficiency for the Australian health system (more on page 27).

FOREWORD BY THE CHAIRMAN

As one of Australia's key nation-building organisations, CSIRO plays a vital and mandatable role in delivering the science that positions this country for a prosperous and sustainable future.

The Board and I continue to observe how the men and women of CSIRO deliver on the strategy, creating value for industry, working with partners in Australia and overseas, advising governments and maintaining a high global standing for quality science.

This commitment to delivering solutions to the big questions that face Australia and humanity is central to the way CSIRO is structured and the role it plays in the National Innovation System. This year, two new National Research Flagships were launched in response to these needs. The Digital Productivity and Services Flagship was launched by the inventor of the World Wide Web, Sir Tim Berners Lee. It is highly appropriate that the organisation that brought wireless local area networks 'Wi-Fi' to the world should keep company with such a digital luminary as Sir Tim.

The Digital Productivity and Services Flagship was launched by the inventor of the World Wide Web, Sir Tim Berners Lee.

And on 25 July 2013, Professor Peter Doherty AC launched the Biosecurity Flagship which will focus on protecting Australia from risks posed by serious pests and diseases. Like other Flagships, the Biosecurity Flagship assembles the strongest multidisciplinary teams to tackle major national and international challenges.

While the National Research Flagships represent 65 per cent of CSIRO's research investment, they are not the totality of collaboration and cross-disciplinary research. Strategic research agreements with General Electric, Orica and BP among others, as well as a strategic relationship agreement with the Defence Science and Technology Organisation are evidence of the way CSIRO is able to work with the best of the best for high impact outcomes.

In this Annual Report we present a wonderful list of scientific achievements that are making a significant contribution to industry and the community generally. It illustrates how CSIRO and its partners are making a difference in areas such as climate change, renewable energy, human health, manufacturing and food security.

I would like to congratulate the CSIRO individuals and teams that received recognition through an impressive array of awards and honours throughout the year and the Board congratulates all our people for the excellent performance of the Organisation as a whole in 2012–13.

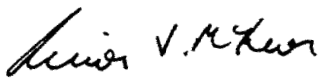
CSIRO and its partners are making a difference in areas such as climate change, renewable energy, human health, manufacturing and food security.

During the year, we welcomed Ms Jane Bennett to the CSIRO Board. We also farewelled Dr Terry Cutler and Dr Don Russell. I sincerely thank them for their valuable contribution to the governance of CSIRO, particularly Terry, who joined the Board in 2002 and served as Deputy Chairman and in a number of other governance roles representing CSIRO.

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

CSIRO is committed to creating a workplace where people go home, not only safely but with a sense of satisfaction from the work they do. This year we have seen increased focus on the impact of behaviours at work on everyone, through the independent review into workplace behaviour initiated by Dr Clark. The CSIRO Board supports this investigation process and we expect to see positive outcomes as the Organisation continues to implement recommendations from that review.

It is an enormous privilege to serve as the Chairman of CSIRO and to have the constant opportunity of witnessing the fabulous work of an extraordinary Australian organisation. I take great pleasure in sharing these highlights in this year's Annual Report.



Simon McKeon AO
Chairman of the CSIRO Board

CHIEF EXECUTIVE'S REPORT 2012–13

YEAR IN REVIEW AND LOOKING AHEAD

YEAR IN REVIEW

CSIRO has had a robust twelve months and despite difficult economic pressures nationally and globally has delivered on its strategy and commitments.

During the second year of our 2011–15 Strategic Plan, CSIRO has continued to deliver results that demonstrate its focus and impact on the big things that matter to this nation.

We have delivered record partnerships with industry and record external partnerships demonstrating the value we are delivering to over 2,000 industry partners, industry-facing consortia such as the Rural Development Corporations and Cooperative Research Centres and our public sector partners such as the Bureau of Meteorology and the Gates Foundation. We delivered on our budget with $734 million appropriation from Government, an increase of $9 million on the previous year, $507 million in external revenue including $38 million in licence revenue and a record $425 million in revenue from our external partners. We made a cash payment to the Federal Government this year of $56.9 million.

Putting our excellent science to use to deliver profound impact is who we are and what we do.

Among the many measures of our impact, this year we had a record 254 licences for our innovations. We delivered hundreds of reports and contributed submissions to inform governments, the community and industry and remain the most trusted advisor to the nation on matters of science and technology.

I believe the foundation and soul of CSIRO is the integrity and excellence of our science. It underpins the impact we deliver today and is the foundation of what we will deliver tomorrow. I am pleased to report that CSIRO has achieved record global standing for our science excellence.

Through our commitment to our partners and our collaborators, we continue to strengthen our position globally. In plant and animal science, environmental sciences and agricultural science we are in the top ten institutions in the world and we report a record 15 areas of science that are in the top one per cent of quality globally. We are building strong partnerships through the establishment of global precincts, national centres and through our regional sites. Our partnership with Australian universities increased and our international connections deepened. In 2012, 48 per cent of CSIRO's scientific publications were co-authored with an international author.

OUR PEOPLE AND OUR VALUES

At the heart of our achievements and goals are our people. Every day I am humbled by the talent and creative spirit of everyone at CSIRO. We all share something special and a desire to ensure our science is used to make a profound and positive impact for the future of Australia and humanity.

To our staff, I reinforce the responsibility of every person 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 have made considerable progress with safety with four Divisions, one of our enterprise service functions and all of our capital projects achieving zero lost time injuries for the first time. However, our lost time injury rate for the first time was 4.9 for the year which is unacceptable and we will continue to make improvements across all our activities.

Last year we launched a number of initiatives in relation to wellbeing, including the new Diversity and Inclusion Plan and on-line training on recognising bullying and harassment in the workplace. We initiated an independent review into bullying, harassment and unreasonable behaviour in CSIRO, Stage 1 of which was published on 14 August, 2013. While the investigation did not find a widespread issue, it did find that there were areas for concern and pointed to clear action for us to take to improve the way we deal with this issue, from it being an individual's issue to an organisational issue. This is how we deal with safety. We are taking action on all of the 34 recommendations of the report as well as long-term strategy in staff health and welfare.

OUR PERFORMANCE

We have never been more focused on the large challenges and issues that face the nation.

Our National Research Flagship Program has received an increased proportion of our resources. This annual report highlights the achievements and progress of our Flagships that I am sure you will enjoy. In particular we launched two new Flagships, the Biosecurity Flagship and the Digital Productivity and Services Flagship. We also consolidated the full spectrum of our research on energy options for the nation in our Energy Flagship, which now represents the largest investment in energy research and development in the nation.

This year we delivered very strongly against our capital projects. The iVEC Pawsey Centre Supercomputer was completed including a groundwater cooling system. The Australian Square Kilometre Array Pathfinder project has 36 dishes installed with six phased array feed receivers. Our team, in a world first, used these to image three radio sources beyond our galaxy. We have now secured funding for 30 of the antennae to be fitted with the phased array feed receivers which will complete the scope of this project. The new Marine Research Vessel the *Investigator* is more than 95 per cent complete.

THE YEAR AHEAD

We will continue to embed our 2011–15 Strategic Plan and work to position CSIRO and Australia's innovation capacity and knowledge infrastructure beyond 2020. I am looking forward to the challenges as well as the opportunities and celebrations 2013–14 will bring for what will again be a significant year for us.

The men and women who work at CSIRO are among the most passionate, committed and hard-working in Australia. It is a privilege to lead CSIRO. I am proud of the evidence I get every day of the difference we make to the lives of Australians. I sincerely thank all our people, as well as the members of the CSIRO Board and Executive Team and our Advisory Boards for their extraordinary effort and commitment and for their valuable contribution to our successes that have added to our proud track record.

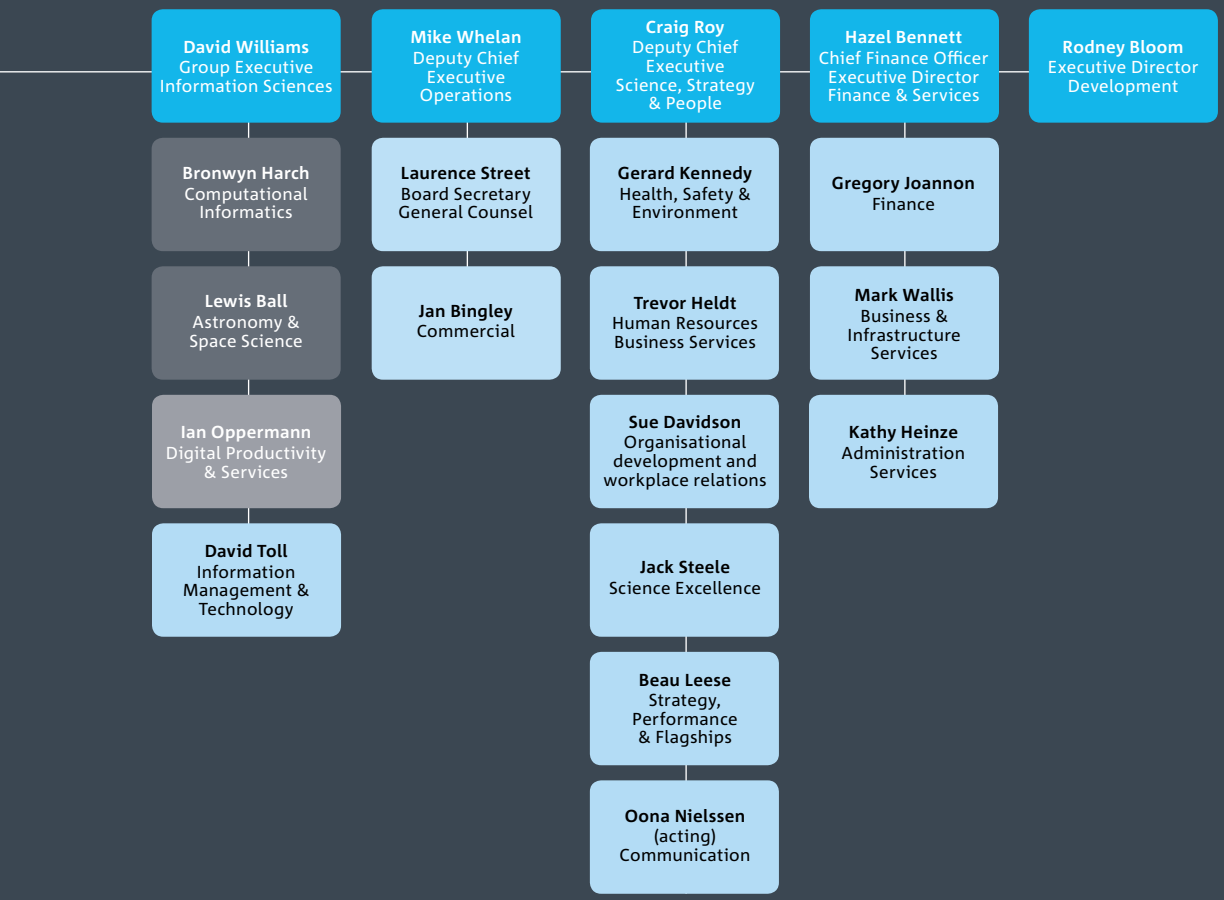
Megan Clark
Chief Executive
September 2013

CSIRO ORGANISATIONAL CHART

AS AT JULY 2013

*The Energy Transformed Flagship was merged with two other portfolios and renamed the Energy Flagship on 1 July 2013

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



CSIRO LOCATIONS

AS AT JUNE 2013

1 Townsville
- Woodstock
- Townsville Australian Tropical Science and Innovation Precinct

2 Brisbane
- Coopers Plains
- Pullenvale
- St Lucia
- Herston
- Dutton Park

3 Armidale
- Chiswick
- Arding

4 Sydney
- North Ryde
- Lindfield
- Marsfield
- Lucas Heights

5 Canberra
- Black Mountain
- Campbell
- Crace
- Yarralumla
- Acton
- Ginninderra
- Tidbinbilla

6 Melbourne
- Aspendale
- Clayton
- Highett
- Parkville
- Collingwood

7 Werribee
- Sneydes Rd
- South Rd

8 Geelong
- Australian Animal Health Laboratory
- Belmont
- Waurn Ponds

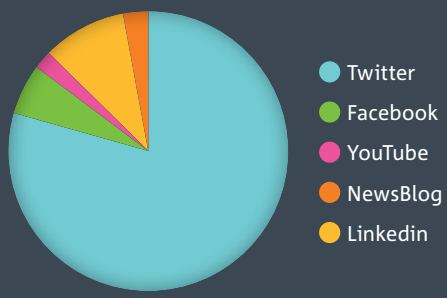
9 Adelaide
- Waite Campus
- Kintore Avenue

10 Perth
- Floreat
- Waterford
- Kensington

SOCIAL MEDIA PRESENCE 2012–13

The last financial year saw significant growth in network sizes and content generation across our social media platforms. Our News@CSIRO blog reached 200,000 total views and our CSIRO Facebook page more than doubled in network size. Our @CSIROnews Twitter account became the second most followed government account in Australia. Our CSIRO YouTube channel reached 1,000,000 total views. We held our first live-streamed events; a lecture on shark tagging and two live Q&As on marine debris and biodiversity.

CONTENT DISTRIBUTION – NUMBER OF POSTS



Facebook

> 27,000 total page likes

> 100,000 weekly reach

> Most liked: 4,320 likes, a quirky chemistry cartoon

> Most shared: 718 shares, an infographic of a partial solar eclipse

> Most viewed media: 5,042 views, a photo of our prototype $7 bank note

Twitter

@CSIROnews:

> 18,000 total followers

> 7,631 tweets

> 4,000 clicks/month

> Top clicked: 1,082 clicks, Dr Who is joining our team (on April Fool's Day)

> Klout: 65

News@CSIRO blog

> 212,015 total views

> 542 posts

> 640 subscribers

> Top post: 19,281 views, Insect of the week: the Plague Soldier Beetle

Linkedin

> 11,826 followers

> 20,500 career page views

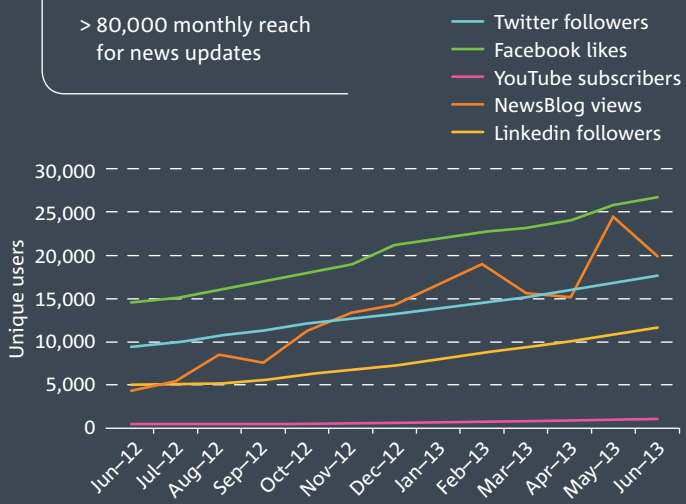
> 80,000 monthly reach for news updates

YouTube

> 1,063,767 video views

> 1,092 subscribers

> Most viewed: 89,653 views, You're on board the Titanic when it sinks!



THE CSIRO TOTAL WELLBEING DIET • **FAST AND FRESH RECIPES**

Fast and Fresh Recipes provides a whole new repertoire of wonderfully easy meal ideas that take little time to prepare.

PART TWO
OUR PERFORMANCE

Part two: our performance

Measuring our performance

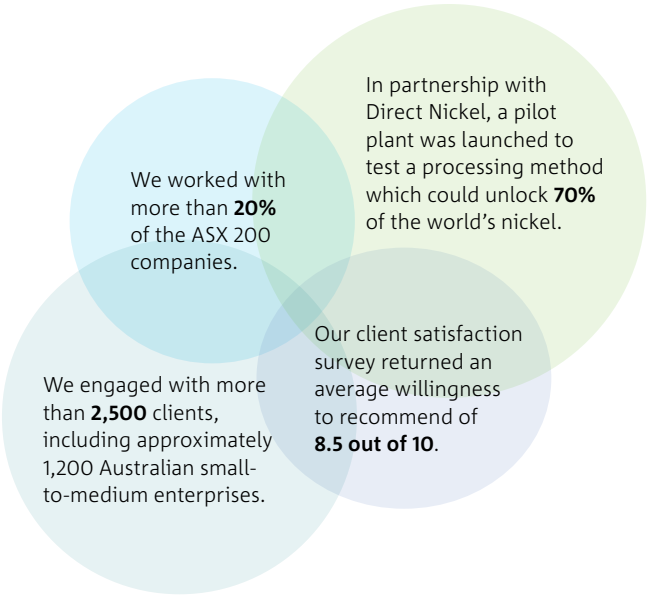
CSIRO continues to play an important role in Australia's National Innovation System. Consistent with its responsibilities outlined in the *Science and Industry Research Act 1949*, CSIRO aims to deliver innovative solutions for industry, society and the environment, and to see our science used to make 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. CSIRO is 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 CSIRO 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 understand national challenges and opportunities and support national priorities
- a trusted advisor to the nation.

CSIRO's activities and achievements are outlined in this section of the annual report, and provide evidence of our performance against the Operational Plan and the Portfolio Budget Statements. In addition to this annual report to parliament, CSIRO also monitors its performance throughout the year by providing:

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



Financial performance

In 2012–13, CSIRO delivered a consolidated deficit from ongoing operations of $21.5 million. Total revenue of $1,246.0 million included appropriation from government of $733.8 million and $506.7 million in revenue generated from other sources and a net foreign exchange gain of $5.5 million. 2011–12 revenue included the recognition of the wireless local area networks (WLAN) plus increased investments to CSIRO's equity investments. Compared with 2011–12, the net value of CSIRO's non-financial assets increased by $64.5 million, which was largely due to an increase in assets under construction reflecting development of major facilities for the nation.

TABLE 2.1: CSIRO'S FINANCIAL PERFORMANCE IN 2012–13 BY SOURCE OF REVENUE, $M

Revenue source	2008–09	2009–10	2010–11	2011–12	2012–13
Co-investment, consulting and services					
Australian private sector	62.1	61.0	65.0	74.2	70.1
Australian Governments	161.4	189.3	202.7	201.8	190.3
Rural Industry R&D corporations	33.8	33.5	37.7	35.0	38.4
Cooperative Research Centres	43.6	38.8	32.3	30.0	16.9
Overseas entities and international	61.5	71.6	74.5	77.5	84.3
Work in progress / deferred revenue	-14.5	-13.6	5.9	-7.6	25.1
Total co-investment, consulting and services	**347.9**	**380.4**	**418.1**	**410.9**	**425.1**
Intellectual property (IP) – royalty and licence revenues	229.6	46.7	29.2	278.5	37.5
Total research and services revenue	**577.5**	**427.1**	**447.3**	**689.4**	**462.6**
Other external revenue	31.3	28.2	47.9	61.3	44.1
Gain on sale of assets	25.6	3.9	4.9	0.4	0.0
Other fair value gains and reversals	0.3	-	0.1	-	5.5
Total external revenue	**634.7**	**459.2**	**500.2**	**751.1**	**512.2**
Revenue from Government	668.1	704.9	720.4	724.9	733.8
Total revenue	**1,302.7**	**1,164.1**	**1,220.6**	**1,476.0**	**1,246.0**
Less expenses	1,180.8	1,333.1	1,231.1	1,275.5	1,267.5
Operating result	**122.0**	**-169.0**	**-10.5**	**200.5**	**-21.5**

Strategy progress

The CSIRO 2011–15 Strategic Plan is underpinned by five strategic objectives:

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

The Organisation intends to plan progressively, to implement change and embed initiatives as 'business as usual' to ensure we deliver on our five strategic objectives over the life of the strategy. CSIRO's Operational Plan and Portfolio Budget Statements provide an overview of the priorities, planned programs, change initiatives and other key activities, along with the resources to implement these for the second year of the 2011–15 Strategic Plan.

OPERATIONAL PLAN – PERFORMANCE ASSESSMENT AGAINST ANNUAL KEY EXECUTIVE ACTIONS

The 2012–13 Operational Plan identified 16 Key Executive Actions (KEAs) to progress the CSIRO Strategy. These actions are designed to focus the Board and the Executive Team's attention on the most important priorities of the Organisation for 2012–13.

An overview of the results achieved for 2012–13 for these actions are below.

Strategic objective 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.

KEY EXECUTIVE ACTION 1: Review and embed key Flagship initiatives including:

(a) Enhanced alignment of Flagship delivery across the energy portfolio.

(b) Embed the two new Flagships in Biosecurity; and Digital Productivity and Services.

(c) Complete the integration and alignment of portfolios across Flagships and Divisions.

(d) Identify and execute upon cross-Flagship opportunities as articulated in Group Strategies.

This year CSIRO has successfully aligned and integrated research themes relating to the two new Flagships (the Biosecurity Flagship and Digital Productivity and Services Flagship (DPAS)), the Future Manufacturing Flagship, and the Energy Flagship. This alignment has increased the total investment in the Flagship program by approximately seven per cent, from 42 per cent in 2011–12 to 49 per cent in 2012–13. Cross-Flagship opportunities were also identified and integrated into strategies, including five key cross-Flagship initiatives: National Outlook Report, Health, Chilean Minerals, Research for Development, and Northern Australia Sustainable Development.

For more information about Flagship achievements see pages 22–43 and Enterprise Strategy Measures (ESM) 10 on page 12.

KEY EXECUTIVE ACTION 2: Embed Impact 2020 principles and methodology into CSIRO's planning and review framework, including further refinement of the model used to articulate and characterise Flagship impact.

In 2012–13, good progress was made towards embedding impact principles and methodology into Enterprise and Flagship planning and review processes. To support consistent implementation of the framework across Flagships, an enterprise framework and supporting guideline for planning, monitoring and evaluating impact has been approved and published. A comprehensive Flagship impact planning database has been updated with approximately 140 live 'impact statements' for ten of 11 Flagships, to inform science planning and investment decisions. A practical 'wiki' resource of 'planning' and 'monitoring' guidelines, tools, and best practices has been developed and published.

For more information about results from CSIRO's impact project see ESM 2 on page 9.

Strategic objective 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.

KEY EXECUTIVE ACTION 3: Finalise, plan and implement the first year of an integrated program to drive our global science standing, including a global recruitment strategy.

CSIRO has implemented a number of initiatives to progress an integrated program to drive its global science standing. These included the introduction of Workforce Investment Agreements, four-year budgets, an Annual Directions Statement and two new Transformation Capability Platforms (TCPs). During the reporting year, a global recruitment strategy resulted in the successful recruitment of eminent science leaders to maintain our world-class capability.

For more information about results from CSIRO's science standing see ESM 5 on page 10 and Program 2 Core Research and Services on pages 42–53.

KEY EXECUTIVE ACTION 4: Develop a shared vision with clear stakeholder commitment for each of the global precincts which includes a resource plan that is consistent with CSIRO's capital plan.

Momentum continues to build across the National Innovation System with the announcement by the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education about its intention to develop Industry Innovation Precincts. This will complement CSIRO's Precinct Program and the development of shared visions for each of the global precincts in consultation with key stakeholders and partners.

For more information about CSIRO's Precincts see ESM 6 on page 10.

KEY EXECUTIVE ACTION 5: Divisions to identify and/or consolidate strategic research partnerships with key global peers with the objective of complementing CSIRO capability.

During 2012–13, CSIRO consolidated its strategic research partnerships and identified initiatives to access new geographical markets and capabilities. For example, agreements were made with the Vietnamese Academy of Science and Technology and Indonesia's Agency for Assessment and Application of Technology (BPPT) to share capability. Strong alliances were maintained with the Chinese Academy of Sciences, Shanghai Nanotechnology and the Korean Institute of Geoscience and Mineral Resources. CSIRO also renewed its agreement with the United Kingdom Meteorology Office in parallel with the Bureau of Meteorology and signed a series of agreements with the United States National Oceanic and Atmospheric Administration (NOAA).

KEY EXECUTIVE ACTION 6: Implement the e-Research and e-Enablement strategies including a five times increase in supercomputing capacity, embedding of enterprise level data management services, and upgrade of all collaboration services.

Implementation of the first year of the e-Research and e-Enablement strategies has resulted in significant improvements for research environments across the Organisation. Achievements included a new supercomputer that provides an increased capacity of six times, approximately one thousand research data collections deposited in the Research Data Service in its first year of service, and rapid growth in roll-out of remote visualisation facilities across all research domains.

KEY EXECUTIVE ACTION 7: Develop decadal science capability plans which will introduce game-changing, disruptive science in areas aligned with our future intended impact.

In 2012–13, CSIRO undertook the development of a draft decadal science plan aiming to describe high-level science priorities to 2026 (CSIRO@100), and a portfolio of game-changing, disruptive science creating options for the impact of the future. The statement, scheduled for release by the end of 2013, will align with the National Research Investment Plan, launched by the Chief Scientist in June 2013.

Strategic objective 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.

KEY EXECUTIVE ACTION 8: Leverage relationships with key global partners to establish two new cross-Flagship large-scale agreements to address global challenges relevant to Australia.

A number of Flagship and cross-Flagship Strategic Partnership Agreements were initiated, including with BP Developments Australia and Marine Innovation Southern Australia (MISA) (approximately $20 million for four years); and the AusAID Research for Development Alliance (approximately $4 million over 18 months).

KEY EXECUTIVE ACTION 9: Grow industry (including small-to-medium enterprises (SMEs)), government, university and community partners' alliances nationally and internationally – critical to the delivery of Flagship goals.

Despite a difficult economic climate, CSIRO continued to grow industry, government, university and community partnerships and alliances.

In the industry sector, CSIRO signed strategic relationship agreements with national and international organisations including BP and Petronas. In addition, CSIRO maintained alliances with organisations including Cotton Seed Distributors, Boeing, Orica, General Electric, Bayer and the Gas Industry Social and Environmental Research Alliance. Engagement with SMEs also grew, with 21 researchers placed in businesses contributing to SMEs' capability. This brings the total to 47 researchers placed in businesses since the program commenced in 2009.

In the government sector, CSIRO maintained its existing partnerships and commenced partnerships with the Australian Solar Institute (now the Australian Renewable Energy Agency), the Defence Science and Technology Organisation, the Australian Maritime Safety Authority, MISA and the United States NOAA. CSIRO also grew its partnership with the Department of Health and Ageing and deepened its strategic partnership coordination with AusAID.

In the university sector, CSIRO signed strategic relationship agreements with the University of Tasmania and Monash University. CSIRO also continued active participation in new and existing Cooperative Research Centres (CRCs).

CSIRO commenced the roll out of its Strategic Relationship Management program, which includes an end of project client satisfaction survey, strategic client interviews and ongoing development of leadership teams across our strategic clients.

For more information on collaboration see stakeholder engagement on pages 12–13 and Program 2 Core Research and Services on pages 47–53.

KEY EXECUTIVE ACTION 10: Deliver to project plans for major infrastructure projects including the Pawsey Centre, the Australian Square Kilometre Array Pathfinder (ASKAP), Sustainable Energy for the Square Kilometre Array (SESKA), the Marine Research Vessel (MRV), National Geosequestration Laboratory (NGL) and the Square Kilometre Array (SKA).

Overall, delivery of major infrastructure projects was largely on track. Delays in delivering the phased array feed affected the ASKAP project budget and schedule scope, resulting in an injection of additional funding and an extension to the project end date – now 2015. Construction of the RV *Investigator* remains on scope and budget, with the vessel due to arrive in Hobart, Tasmania in late 2013.

For more information about National Research Infrastructure and Facilities see Program 4 on pages 71–75.

Strategic objective 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.

KEY EXECUTIVE ACTION 11: Building on the Values Compass, refresh our approach to 'what it is like to work in CSIRO' to further support the maturity of an innovative environment.

This year CSIRO completed a number of initiatives to progress the innovation maturity of the Organisation and build on the CSIRO Values Compass. This included a commitment to partner with Comcare to develop and deliver an integrated five-year action plan, develop and apply the CSIRO Innovation Roadmap and achieve a 100 per cent completion rate for staff undertaking an online Prevention of Bullying and Harassment training course.

A number of learning interventions have also been developed and implemented to support cultural change that is in line with our Diversity and Inclusion, and Health, Safety and Environment (HSE), strategies and targets.

For more information about CSIRO's People see Our People on pages 102–104.

KEY EXECUTIVE ACTION 12: Develop four-year Divisional workforce plans aligned with future impact requirements and budget process.

A four-year 'Workforce Investment Agreement' framework was scoped, developed and implemented for the first time to provide a four-year articulation of CSIRO's workforce requirements aligned to future impact needs. As part of this process Flagships and Divisions were able to highlight much more clearly those areas of growing and declining demand. It is anticipated this resource will enable strong workforce planning activity in 2013–14.

KEY EXECUTIVE ACTION 13: Develop four-year CapEx plan that prioritises infrastructure for both science competitiveness and operations effectiveness while reducing the depreciation burden in the long-term.

CSIRO strengthened its capital planning and expenditure processes including approval of a four-year Capital Management Plan by the Department of Finance and Deregulation (DoFD). A ten-year Property Investment Plan has been endorsed by the Executive Team and Board and governance processes for the assessment of future initiatives relating to property capital expenditure were established.

KEY EXECUTIVE ACTION 14: Develop future options for financial sustainability to 2016 and beyond, within the current business model and considering potential growth options.

CSIRO undertook significant interventions in 2012–13 to address the financial sustainability of the Organisation to 2016 in what is a challenging fiscal environment. These included a new Annual Directions Statement and 2014–15 planning and budgeting process that incorporated a significant and challenging portfolio adjustment and cost reduction program to enhance our financial sustainability.

A draft strategy to enhance CSIRO's translational innovation and technical services business model was developed. The model will enhance our ability to manage and grow activities that translate research findings into useful results, as part of our broader collaborative research and development portfolio and business model.

Strategic objective 5: Trusted Advisor

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

KEY EXECUTIVE ACTION 15: Execute a systematic engagement strategy which includes both national areas of science interest for our outcome domains.

This year, five media campaigns were implemented as part of our systematic engagement strategy designed to communicate the benefits of specific areas of science including:

- **Astronomy:** Opening ceremony for the Australian Square Kilometre Array Pathfinder (ASKAP) and the Murchison Radio-astronomy Observatory (MRO) (October 2012). Designed to engage with the community, communicate the features of CSIRO's major project and how it supports astronomy research.
- **Digital Productivity:** Launch of the Digital Productivity and Services Flagship (January 2013). Designed to engage with industry and government and demonstrate the value of CSIRO's research in digital productivity and services and assist in unlocking the benefits of the new National Broadband Network.
- **Marine:** A Shore Thing (January 2013). Designed to engage with government, industry and the community to demonstrate our research in marine science.
- **Social:** Science with a Heart (February 2013). Designed to engage with the disadvantaged section of the community, including demonstrating some social and humanitarian benefits from research such as how science helps disadvantaged people in Australia and overseas.
- **Manufacturing:** Manufacturing a Brighter Future (May 2013). Designed to engage with industry and demonstrate CSIRO's positive industry impact.

KEY EXECUTIVE ACTION 16: Develop and implement a marketing strategy to address the primary areas of industry, government and the community.

An enterprise-wide program of systematic engagements with industry, government and community stakeholders commenced to regularly communicate CSIRO's future and realised impact. CSIRO also strengthened its brand recognition, primarily with community members aged between 18–30 years through its social media campaigns. As at 30 June 2013, CSIRO had a combined total of 76,985 followers on YouTube, Facebook, Twitter, LinkedIn and NewsBlog. This is a 56 per cent increase from 2011–12.

For more information about CSIRO's science outreach program see Program 3 on page 64 and social media presence on page xv.

ENTERPRISE STRATEGY MEASURES (ESMs)

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

1. **Impact:** Delivering results with relevance and impact across areas of importance for Australia.
2. **Science:** Performing high-quality science.
3. **People:** Building and maintaining strong relationships with customers, partners, staff and other stakeholders.
4. **Resources:** Effective resourcing of CSIRO's activities.

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

ENTERPRISE STRATEGY MEASURES RESULTS

IMPACT

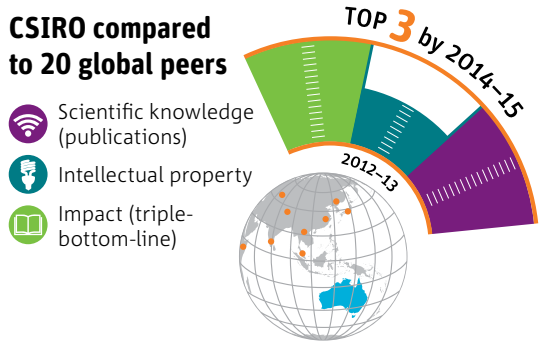
ESM 1: Develop measures in 2011–12 for delivery of triple-bottom-line[1] impact through evaluating realised benefits. Be recognised as one of the top three global applied science organisations by 2014–15 for impact delivery as measured against our 20 global peers[2].

When compared against relevant impact related performance dimensions, CSIRO is within the top ten applied research organisations in the world. Analysis of the use or impact of scientific knowledge in terms of citations, intellectual property and triple-bottom-line, suggests that CSIRO is on track to being in the top three applied science organisations globally by 2014–15 (see Figure 2.1).

In terms of impact of our science and scientific knowledge, the analysis suggests CSIRO is performing equal to or better than most of its global peers (Top three)[3]. Normalised citation impact indicates that CSIRO is ranked second in the group of 20 nominated global peers[4]. Our delivery of scientific solutions that contribute to significant economic, environmental and social impact for Australia in terms of scale and reach also places us in the top three when compared to global peers. Analysis of the patent filings registered in the World Intellectual Property Database (WIPO) indicates that CSIRO has not yet reached the top three, but is ranked within the top ten due to it being Australia's largest patent holder in 2012 (3,454 patents, 718 inventions and 281 trademarks) and 33 per cent of our patent families being the product of collaborative activity with external parties[5].

Evidence of CSIRO's impact is demonstrated in the achievements in Program 1 – National Research Flagships, see pages 22–43.

Figure 2.1: CSIRO compared with 20 global peers (see page 196 for names of science research organisations)



1 The triple-bottom-line refers to economic, social and environmental impacts.

2, 3 Refer to the glossary on page 196 for a table of the 20 global peers used in this comparison.

4 This 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 using the new Crown Indicator methodology. See glossary page 193 for more information.

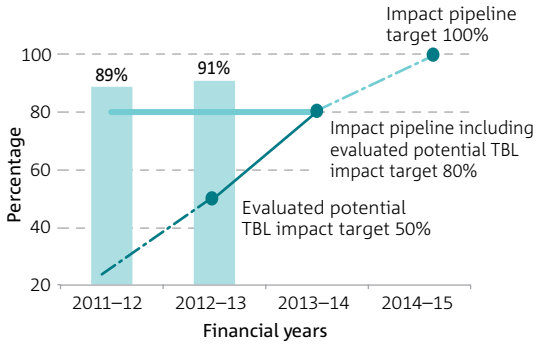
5 Patent co-operation treaty (PCT) applications data was only available from WIPO database for calendar year 2011 and 15 of the 20 peers. See glossary page 193 for more information.

ESM 2: Develop future impact pipelines for at least 80 per cent of the Flagships 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.

Last year 89 per cent (8 of 9) of Flagships had articulated future impact pipeline including an evaluation of triple-bottom-line value. This year this increased to 91 per cent (10 of 11 Flagships) (see Figure 2.2). The impact statements for these Flagships provide the basis for assessing future progress towards impact to ensure time-to-goal expectations are being refined and or achieved.

For more information about CSIRO's impact project see page 4.

Figure 2.2: Flagship future impact pipelines including an evaluation of potential triple-bottom-line impact



Note: total number of Flagships increased from 9 to 11 in 2012-13 FY.

ESM 3: Baseline clients' willingness to recommend in 2011–12 and improve our performance year-on-year over the strategy.

In a client satisfaction survey undertaken from 1 June 2012 – 31 May 2013, CSIRO was rated on average 8.5 out of 10 on 'willingness to recommend', indicating that the majority of clients are satisfied. This year is the first year results have been reported for this measure. A baseline has now been set to assess performance for each remaining year of the strategy. This strong result indicates CSIRO's clients are willing to return to CSIRO in the future and similarly encourage their networks to do the same.

For more information on CSIRO's client satisfaction survey see page 18.

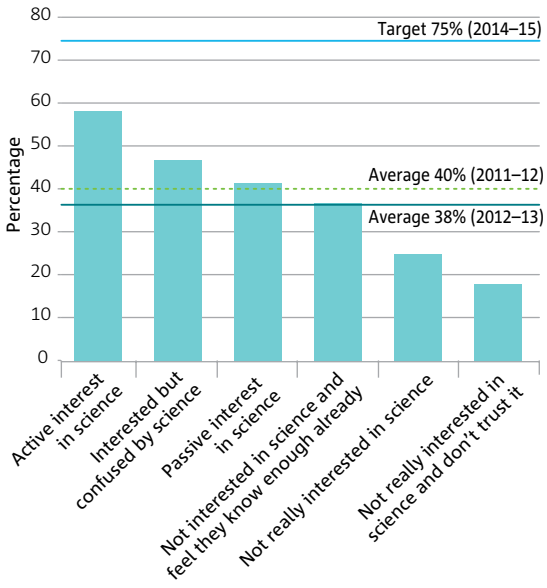
"We are charged with delivering world-class technology solutions sourced from the very best global research organisations. Our research partnership with CSIRO sets the standard by which we judge others."

Don Winter, Vice President, Flight & Systems Technology, Boeing Company

ESM 4: 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 life. In 2013, 38 per cent were able to name a positive contribution that they believed CSIRO had made to their lives[6]. Responses by different segments of the community can be attributed to their different levels of receptiveness to science information (see Figure 2.3). Using this segmentation analysis, CSIRO is able to undertake more targeted communication activities to reach the different segments with messages that most appeal to their values and preferred media channels.

Figure 2.3: Community awareness of impact derived from CSIRO activities



For more information on awareness of science by CSIRO stakeholders see pages 67–68.

SCIENCE

ESM 5: 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, CSIRO ranks in the top one per cent globally in a further 11 research fields. The total number of fields in which CSIRO is ranked within the top one per cent has increased from 14 last year to 15 this year, with the addition of Physics.

CSIRO also maintained its publication quality with its citation impact being 56 per cent better than the global average for the period 2008–12. CSIRO produced 5.9 per cent of Australia's research publications, with Australia representing 3.6 per cent of global research publications, while maintaining a relatively high citation impact over this period. CSIRO is also a major contributor to Australian publications, producing 21 per cent of Australian publication output in Agricultural Sciences; 18 per cent in Space Sciences; 17 per cent in both Environment/Ecology and in Geosciences; and 14 per cent in Plant and Animal Sciences.

For more information on CSIRO's publication output and citation impact see Program 2 pages 46–49.

ESM 6: 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.

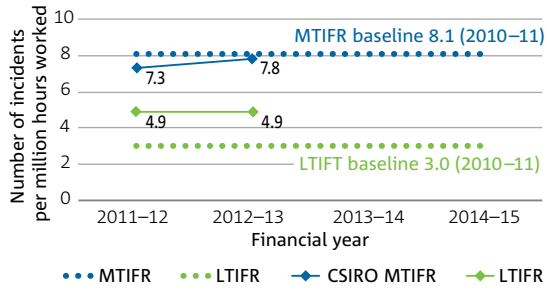
Momentum continued to build across the National Innovation System for the establishment of precincts of global scale and standing. The announcement of

6 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.

Industry Innovation Precincts by the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education was a significant milestone as it included the Australian Manufacturing and Materials Innovation Precinct headquarters located at the CSIRO and Monash University-led Precinct in Clayton, Melbourne. CSIRO will be a major partner in the Industry Innovation Precincts as they complement CSIRO's Precincts and enable CSIRO to better engage with researchers, industry, government and the community.

For more information on CSIRO's Precinct Program see page 5.

Figure 2.4: CSIRO lost time and medical treatment frequency rates



PEOPLE

ESM 7: No fatalities or major injuries of CSIRO people. Lost time injury frequency rate (LTIFR)[7] and medical treatment injury frequency rate (MTIFR)[8] improves year-on-year and is in the top quartile of like organisations by 2014–15.

The LTIFR for 2012–13 was 4.9, in line with the 2011–12 performance. A nine per cent reduction in the incidence of physical injuries during the year was offset by a corresponding increase in reporting of mental stress and anxiety-related illnesses. The increase in mental stress and anxiety related illness could be attributed to increased awareness among staff to report mental health illnesses that may have a work related component.

The MTIFR for 2012–13 was 7.8, higher than 2011–12. This marginally higher MTI frequency rate compared to the previous period was in part due to an increase in early intervention treatments for muscular skeletal injuries. This early intervention approach is being actively encouraged to resolve and prevent muscular skeletal injuries from developing to a more disabling level (see Figure 2.4).

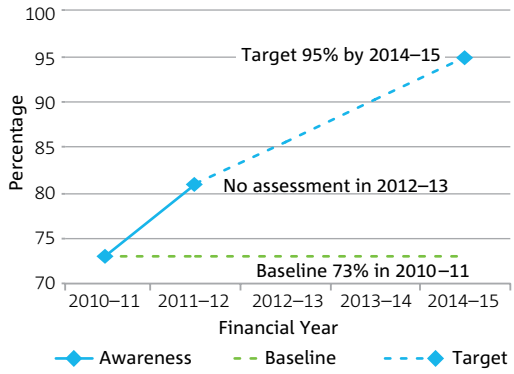
For more information on CSIRO's Health and Safety program see pages 95–97.

ESM 8: 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.

Values awareness was not measured in 2012–13. However, during the year CSIRO continued to review responses to questions from the 2010–11 and 2011–12 survey to improve the application of our values in the Organisation (see Figure 2.5). A survey will be undertaken in 2014 against which performance will be assessed.

For more information about CSIRO's values see Our People on page 102 and KEA 11 on page 6.

Figure 2.5: Awareness of CSIRO Values



7 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.

8 MTIFR is the number of incidents requiring medical treatment (beyond first aid) per million hours worked.

RESOURCES

ESM 9: CSIRO's financial, operating and capital management performance meets approved annual budget.

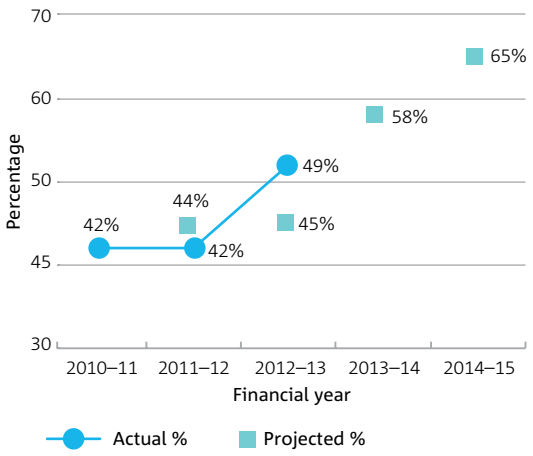
CSIRO's financial, operating and capital management performance was within the approved annual budget. CSIRO did not fully spend its capital budget due principally to a re-phasing of our major projects (the Marine Research Vessel, the Pawsey Centre, the Sustainable Energy for the Square Kilometre Array, the Australian Square Kilometre Array Pathfinder and the National Geosequestration Laboratory) which was approved by the Department of Finance and Deregulation resulting in a $39 million reduction in the capital expenditure envelope to $177.2 million.

For more information on CSIRO's financial performance see KEA 14 on page 7 and Table 2.1 on page 3.

ESM 10: Direct investment of CSIRO resources towards major national challenges and opportunities through the National Research Flagships increases to 65 per cent by 2014–15.

Indicative figures suggest that direct investment is above 48.6 per cent for the 2012–13 Financial Year (see Figure 2.6).

Figure 2.6: Direct investment of CSIRO resources in the National Research Flagships



For more information refer to KEA 1 on page 4 and Program 1 on pages 15–43.

STAKEHOLDER ENGAGEMENT

CSIRO continues to build and maintain strong relationships with its customers, partners and other stakeholders that are critical to CSIRO's success.

Cooperative Research Centres (CRCs)

CSIRO engages in CRCs to build critical mass in research ventures, which tackle clearly articulated major challenges for end-users. In line with this, CSIRO remains the largest single participant in the CRC program. Throughout the life of the program, CSIRO has participated in 139 of 196 CRCs, and is active in 20 of the current 38 CRCs. CSIRO's direct contribution to CRCs was $13.6 million in 2012–13.

CSIRO participated in five of the six successful Round 14 CRCs, which commenced operations on 1 July 2012. CSIRO did not participate in any bids in Round 15, but has engaged in five bids for Round 16 in 2013, being successful in moving through to Stage 2 of the selection process with four bids.

Government engagement

CSIRO also undertakes regular meetings with Ministers, Parliamentarians and their senior staff from relevant government departments to provide scientific information and advice to inform policy development and program implementation and evaluation. Examples include contributing to the development of the National Food Plan and the National Innovation System.

CSIRO's Chief Executive has continued to be active in a number of government forums, including the Prime Minister's Science, Engineering and Innovation Council, the Prime Minister's Taskforce on Manufacturing and the Precincts Board. CSIRO staff have also participated on the Australian Research Committee.

CSIRO made seven submissions to Federal parliamentary inquiries and CSIRO officers attended nine hearings to provide further evidence to these inquiries. CSIRO held four Science for Breakfast briefings for parliamentarians and their staff at Parliament House. Briefings covered aspects of shale gas in Australia (August 2012), Australia's marine economy (October 2012) our future health (March 2013) and biosecurity (June 2013).

For information on university collaboration see page 47 and for collaboration with the general public see Program 3 page 64.

Indigenous Engagement Strategy

In 2012–13, CSIRO undertook an extensive campaign to recruit Indigenous trainees. Ten trainees were appointed in a number of fields including aquaculture; energy; human resources; agriculture; astronomy and space science; and plant industry. The cadet and trainee retention rate has remained high at 90 per cent. The number of Indigenous employees increased by four, with an internship being provided to a former cadet in marine science and a postgraduate scholarship awarded to an Indigenous PhD student. These increases saw a rise in Indigenous staff in CSIRO to 53.

CSIRO also initiated the first Deadly Scientist or Science Project Award as part of the prestigious Indigenous Deadlys Award, which is a national Indigenous competition promoting excellence in the arts, health, community development and now science. During the reporting year, two cultural awareness programs were run in Newcastle and Perth. The Indigenous Seeing Through Both Eyes Strategic Awareness program will resume in the latter part of 2013 with programs scheduled for Brisbane, Sydney, Canberra, Melbourne and Adelaide.

This year saw a change to the governance for implementing the Indigenous Engagement Strategy with the establishment of an additional high-level Strategic Advisory Committee (SAC) and a shift from a Steering Committee to an Implementation Committee. The SAC will comprise Aboriginal and Torres Strait Islanders and will be co-chaired by a nationally significant Indigenous leader and the Executive Team Leader for Indigenous Engagement. The SAC will provide CSIRO with independent external input into an annual assessment of progress in the Organisation's engagement with Indigenous Australians.

This will have particular relevance to the four pillars of the current Indigenous Engagement Strategy (science opportunities, employment, education outreach and cultural awareness). The Implementation Committee will provide strategic oversight of CSIRO's Indigenous Engagement Strategy and associated organisational change. The Implementation Committee will also provide collective leadership in delivering organisation-wide progress against strategic objectives through the coordination of project activity.

Programs

CSIRO receives approximately 59 per cent of its operating revenue in appropriation funding from the Federal Budget. Our commitment to the parliament and people of Australia, set out in the 2012–13 Portfolio Budget Statements (PBS), is to contribute to the following outcome[9]:

> *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 publicly-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 its activities and science.

This is achieved through the following 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 CSIRO consolidated financial performance by PBS Program.

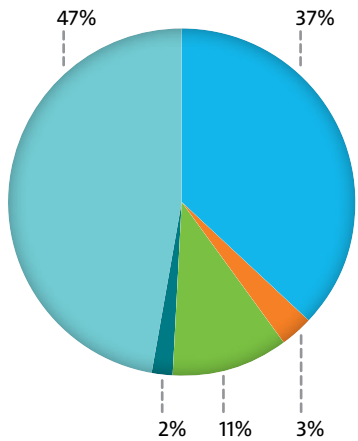
9 The relevant section of the Portfolio Budget Statements can be viewed at: www.innovation.gov.au. The Outcome is the formal legal statement of the purpose for which funds are appropriated to CSIRO.

TABLE 2.2: CSIRO – FINANCIAL SUMMARY BY PBS PROGRAM[10], 2012–13, $M

	Actual[11]	PBS 2012–13 Budget[12]	Variance
Government revenue	733.8	736.8	-3.0
External revenue	501.0	482.9	18.1
Other revenue	5.5	0.00	5.5
Total revenue	**1,240.3**	**1,219.7**	**20.6**
Program 1 – National Research Flagships	599.7	575.0	24.7
Program 2 – Core Research and Services	480.4	508.2	-27.8
Program 3 – Science Outreach: Education and Scientific Publishing	32.1	37.7	-5.6
Program 4 – National Research Infrastructure: Facilities and Collections	143.0	123.6	19.4
Program 5 – Science and Industry Endowment Fund	26.1	23.6	2.5
Total expenses	**1,281.4**	**1,268.1**	**13.3**

Figure 2.7: Actual expenditure

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



10 Portfolio Budget Statement Programs.

11 Actuals are taken from the Consolidated Financial Statements of Comprehensive Income for the period ending 30 June 2013.

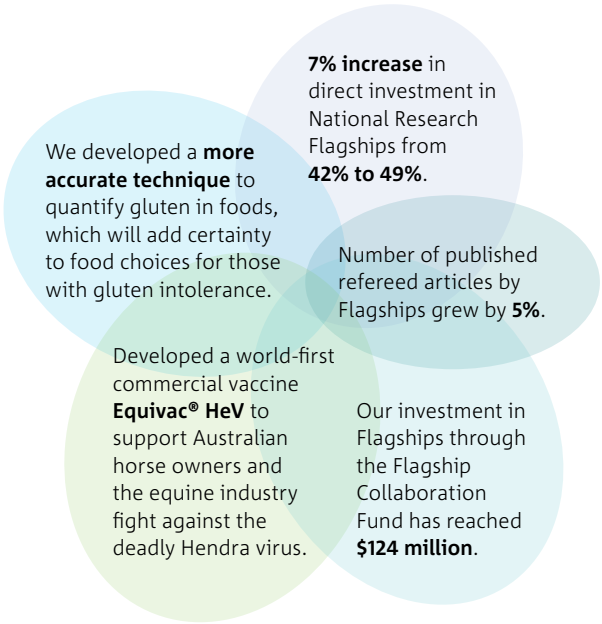
12 Figures are taken from the 2012–13 PBS – Page 296.

PROGRAM 1
National Research Flagships

OBJECTIVES AND DELIVERABLES

We embrace our distinct role as a large-scale mission-directed, multidisciplinary science and technology organisation and as a trusted science advisor on the big issues facing the nation. A key objective of the 2011–15 Strategic Plan 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.

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



In 2012–13, CSIRO devoted 49 per cent of its resources to its 11 National Research Flagships:

- Biosecurity
- Climate Adaptation
- Digital Productivity and Services
- Energy Transformed
- Food Futures
- Future Manufacturing
- Minerals Down Under
- Preventative Health
- Sustainable Agriculture
- Water for a Healthy Country
- Wealth from Oceans.

Through the National Research Flagships Program we intend to concentrate on strategic research, knowledge and technology transfer with the potential to deliver major long-term social, economic and environmental benefits to Australia. The Flagships target clearly defined goals, framed from a careful analysis of the needs of people and enterprises and have 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 44 for Program 2 Core Research and Services).

PROGRAM PERFORMANCE

This year, the National Research Flagships Program continues to perform well. Based on an assessment of the five key performance indicators (KPIs) identified in the PBS, CSIRO has met expectations and targets. Table 2.3 provides an overview of the evidence for each KPI with a more detailed analysis following the Table.

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

Key performance indicator	Target (and performance assessment)	Performance
The number of refereed Flagship publications	Maintain or increase	In 2012, CSIRO increased the number of refereed publications by Flagships by five per cent (2,007 in 2012 compared with 1,903 in 2011). This included 569 conference papers, 1,119 journal articles, 106 books/chapters and 213 technical reports (more on page 17).
Financial support by Flagship partners	Maintain or increase	In 2012–13, $270 million was received in revenue for the National Research Flagships Program from external partners (see Figure 2.9). Although this is a $58 million increase from last year, external revenue only equates to 40 per cent of the total investment in Flagships.
Customer satisfaction	Maintain	This year is the first year of results for our client satisfaction survey (baseline year). Our client satisfaction survey returned an average 'willingness to recommend' of 8.5 out of 10.
Investment of the Flagship Collaboration Fund	As per plan	As at 30 June 2013, over $124 million has been committed for the life of the Flagship Collaboration Fund. This includes $17 million in grants committed in 2012–13 (more on page 19).
Demonstrated adoption and impact of Flagship outputs	Growing economic, social, environmental and intangible benefits	Two external Flagship reviews were undertaken during the year which included the Future Manufacturing Flagship (FMF) and the Energy Transformed Flagship (ETF). The panel observed that the FMF scientific output was of a very high standard and world-class. The ETF review concluded that it is operating as best practice within CSIRO. The Sustainable Agricultural Flagship (SAF) review was conducted in May 2012. SAF review report was released during 2012–13 and the panel concluded SAF had delivered significant outcomes. See page 20 for details on review outcomes and pages 22–43 for Flagship achievements.

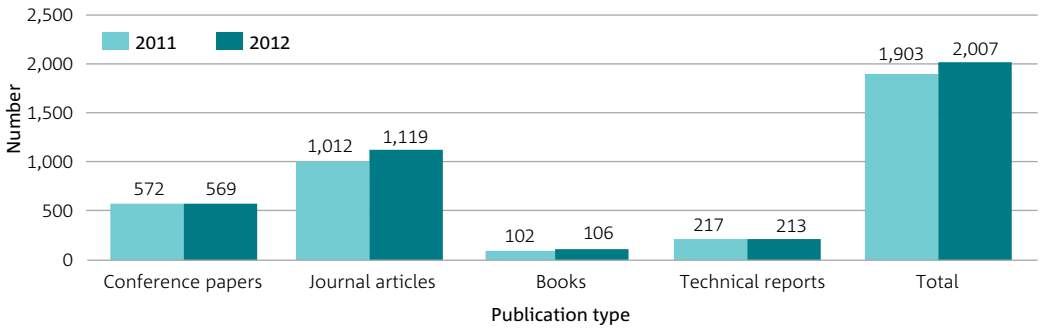
Green shading: indicates positive progress for the year and the target has been achieved. **Yellow shading:** indicates some challenges have occurred during the year, but they were managed. **Red shading:** indicates challenges have affected progress and resulted in the target not being achieved. **White/no colour:** indicates that this is the first year results have been recorded for this indicator therefore no trend can be observed.

FLAGSHIP PUBLICATIONS

Indicator: The number of refereed Flagship publications.

The total number of refereed publications produced by Flagships increased slightly by five per cent between 2011 and 2012, see Figure 2.8[13].

Figure 2.8: Flagship publications[14]



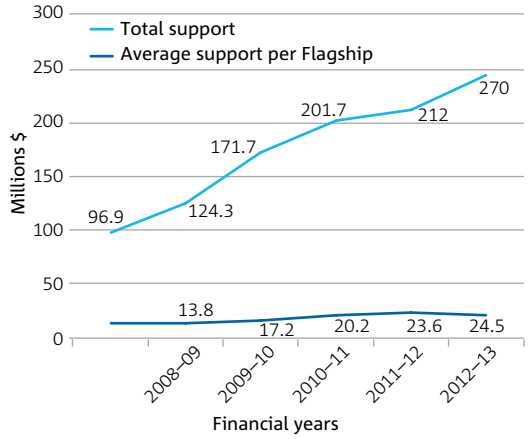
Explanatory note: Flagship publication numbers reported for 2011 were reviewed in July 2012 and, as a result, there has been an overall increase in the number recorded from 1,618 (as recorded in the 2011–12 Annual Report) to 1,903 (as reported in Figure 2.8). This can be attributed to the implementation of CSIRO's 'ePublish' database. This internal data electronic publications repository was created in 2009 and, as a result, revisions to reported numbers are expected to continue for a couple more years, until the program is completely installed and utilised across the Organisation.

FINANCIAL SUPPORT FOR FLAGSHIPS

Indicator: Financial support by Flagship partners.

In 2012–13, $270 million was received in revenue for the National Research Flagships Program from external partners (see Figure 2.9). Although this is a $58 million increase from last year, external revenue only equates to 40 per cent of the total investment in Flagships.

Figure 2.9: Financial support from external partners for Flagships



13 Source: CSIRO's electronic publications repository 'ePublish'.

14 See glossary page 193 for definition of publication types.

CUSTOMER SATISFACTION AND ENGAGEMENT

Indicator: Maintain customer satisfaction.

CSIRO will continue to be a trusted advisor to its partners and will continue to engage with industry, government and the community to deliver profound impact.

CSIRO works with approximately 3,000 clients per annum, including more than 20 per cent of Australian Stock Exchange (ASX) 200 companies; and approximately 20 per cent of Australia's research and development active companies.

CSIRO and its key partners continue to develop and maintain relationships with government departments and agencies to assist with the delivery of large-scale national projects.

> *"CSIRO is our broadest and deepest R&D partnership, together we are delivering impact on a regular basis."*
>
> Jez Smith, Technical Advisor, Orica Limited

CSIRO is the single largest participant in the CRCs' program and is involved in 20 of the current centres in all six sectors of the program.

To create long-term, large-scale research programs, CSIRO has identified a series of initiatives to improve relationships with its clients. This includes a newly implemented client satisfaction survey (CSS) and regular interviews with strategic clients. Feedback from these programs provides CSIRO with valuable insights into clients' needs enabling more productive relationships and improvements to services offered.

For 2012–13, our client satisfaction survey returned an average 'willingness to recommend' of 8.5 out of 10[15]. The CSS is now embedded as business as usual and client satisfaction will continue to be tracked, benchmarked and reported on in future years. The survey also asks respondents to identify their primary reasons for the score given, with the top five primary reasons being; Science Excellence, Client Service, Quality of Work, Professionalism and Timeliness.

CSIRO's CSS is a simple two question online survey that is conducted on a random sample of our projects. The CSS captures feedback from clients and provides a reliable measure of client satisfaction for CSIRO. This measure will serve as a baseline for comparison in future years.

The CSS asks our client to rate their 'willingness to recommend' our services to colleagues or associates. This is based on a CSS methodology called the 'Net Promoter System', developed by Bain & Co.

For more information on client's 'willingness to recommend' see ESM 3 on page 9 and information about CSIRO's agreements refer to the KEAs on pages 4–7.

FLAGSHIP COLLABORATION FUND

The Flagship Collaboration Fund has continued to perform its role as a key mechanism for supporting impact partnerships across our 11 Flagships to assist delivery against their goals. This year it contributed a total of $17 million investment in the Flagships. This supported the funding of three new research clusters to commence three-year work programs, that leveraged funds from partners for a total value of $34 million. These clusters will:

- deliver engineering options and adaptation strategies for extreme weather events in line with internationally agreed climate modelling scenarios
- reduce gaps in knowledge to underpin the future of Australia's clean energy system
- develop key data to accelerate the development of national assessments of carbon in our marine and coastal environments and how these systems can help Australia move to a low carbon economy.

The Fund also supported cross-Flagship opportunities for the following three Flagships:

- the Minerals Down Under Flagship and Future Manufacturing Flagship, to establish a 'Wealth from Waste' Cluster with universities to systematically evaluate options for unlocking and recycling the resources contained in manufactured products

15 The 'willingness to recommend' rating of 8.5 out of 10 is based on a nine per cent margin of error at a 95 per cent confidence interval.

- the Digital Productivity and Services Flagship for a three-year cluster for a new Superannuation Program partnership with Monash University valued at more than $3 million. The program will commence in the 2013–14 financial year.

This year also saw the conclusion of a three-year Mineral Futures Flagship Collaboration Fund Cluster which highlighted the need for a national conversation on the future of Australia's resources. The Cluster was led by the University of Queensland's Sustainable Minerals Institute and also included the University of Technology Sydney, Curtin University, CQ University Australia and the Australian National University. One example of the Cluster's impact is its Vision 2040 report which outlined a range of potential futures for Australia. Another illustration of the influence of the Cluster is its work into the impact of mining operations on communities and where effort is now being progressed through the company Ninti One with support from the Cooperative Research Centre for Remote Economic Participation.

A Food Futures Flagship Collaboration Fund Cluster on Sex Ratio and Sterility, led by University of Queensland and with Australian and international universities including Simon Fraser University in Vancouver, Canada, have been investigating how to better manage sex and sterility in farmed animals to improve productivity, profitability and animal welfare. Producing only female salmon is critical to the success of the $408 million Atlantic salmon aquaculture industry in Australia and to date researchers have found, using genetic markers and gene sequencing technology, a way to determine the sex of a fish from a particular family.

In addition to these clusters, over 60 smaller projects, visiting fellowships and student scholarships provided specific expertise and talent development opportunities for the Flagships and their partners including US, European and Asian counterparts.

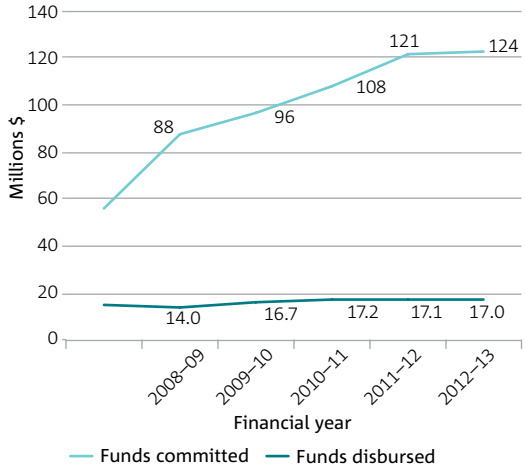
INVESTMENT OF THE FLAGSHIP COLLABORATION FUND

Indicator: Investment of the Flagship Collaboration Fund as per agreed guidelines.

Investment in the Flagship Collaboration Fund continued on a similar growth trajectory as previous years. This growth pattern has resulted in almost $124 million to date being committed to assisting Flagships and their partners deliver their goals (see Figure 2.10).

Of the $17 million dispersed to external partners in 2012–13, over 75 per cent of available funding supported the research clusters, with the remaining proportion allocated to smaller research projects, visiting fellowships and student scholarships.

Figure 2.10: Flagship Collaboration Fund disbursement and commitments



FLAGSHIP ECONOMIC, SOCIAL, ENVIRONMENTAL AND INTANGIBLE BENEFITS

Indicator: Evidence of growing economic, environment, social and intangible benefits through demonstrated adoption of Flagship outputs.

To maximise achievement of Flagship goals, CSIRO conducts independent reviews of each Flagship on a three-to-four-year cycle. Each review is conducted by a panel of scientific and industry experts from Australia and overseas. Two reviews were undertaken in 2012–13 and a report completed for the Sustainable Agriculture Flagship review in 2011–12. The Panels rate each research theme within the Flagship for the probable impact on end-users. The results of these assessments demonstrated that over 80 per cent of the research themes reviewed for these three Flagships at the very least, enabled commercial, environmental, community or policy development that distinguishes user organisations from peers or competitors[16]. Table 2.4 includes a summary of the key outcomes from these reviews by Flagship.

16 Refer to the glossary on page 193 for Flagship Review criteria for the Panel's assessment.

TABLE 2.4: RESULTS OF FLAGSHIP SCIENCE REVIEWS

Sustainable Agriculture Flagship

Date of review: May 2012
(Report released in 2012–13)

The review panel was extremely impressed with the work of the Flagship which concluded that:

- in the three years of its existence it had delivered significant outcomes desired by many stakeholders
- the Flagship had added significant value to the integration of agriculture expertise across many Divisions of CSIRO
- going forward, the Flagship should consider expanding its impact and communication strategies to include the integration of the broader Australian community and the international agencies tasked with measuring and innovating to improve the sustainability of terrestrial production systems
- the Flagship should consider facilitating a dialogue with Australian universities and other agencies leading research, development and extension in agriculture and natural resource management, with the aim of developing an integrated national effort underpinning the understanding of sustainable agricultural production systems.

Future Manufacturing Flagship

Date of review: September 2012

The panel was impressed by the range of strategies developed by the Flagship to engage with industry and assessed that:

- the scientific output of the Flagship to be of a very high standard with much of the science at the world forefront and was greatly impressed with the quality and breadth of its achievements
- the placement of researchers for an extended period with industry partners is seen to be an outstanding initiative and should be pursued more aggressively, as it has the potential to be the most important single initiative the Flagship can make to meet its stated goal
- the Flagship has a highly quantified and transparent system for measuring research excellence
- there is an opportunity for the Flagship to more effectively articulate the positive impacts arising from its projects and to measure the magnitude of these impacts relative to the investments being made
- the Flagship should be encouraged to link investment decisions to impact targets set on the basis of a comprehensive portfolio analysis.

Energy Transformed Flagship

Date of review: November 2012

The review panel reported that they considered the Flagship as demonstrating 'best practice' within CSIRO. CSIRO's strategy was seen to be at its core. People were highly regarded and had good working relationships with external partners. They undertook innovative collaborations to deliver positive impact for Australia and internationally. Specifically, the panel assessed that the Flagship's:

- projects were well-chosen and should continue
- holistic efforts to blend economic modelling, social sciences and technology be commended
- investment in solar thermal power is appropriate as a major investment focus and commended it for its other focus areas which are of national importance, including the National Outlook project, for which the panel applauded the Flagship for undertaking such a high-risk reward project and rated the project as an outstanding development.

More information about all 11 Flagships' growing economic, social and environmental benefits through the adoption of their research outputs can be found on pages 22–43.

WE AIM TO LEAVE A POSITIVE AND LASTING IMPACT FOR FUTURE GENERATIONS

Our science and technology touches every part of Australia and the lives of all Australians

Agriculture

Over **95%** of Australia's cotton crop based on CSIRO varieties; using **85%** less insecticide and **52%** less herbicide.

'Perfect prawns' could increase the value of the aquaculture industry by **$120 million**.

Mining and minerals

Longwall mining technology improving productivity and worker safety in coalmines.

TiRO technology building a new titanium industry worth **$275 million**.

Energy

Ultrabattery commercialised and on Australia's largest renewable energy storage system trial.

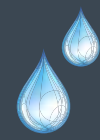
CSIRO HVAC technology reduces total air conditioning electricity consumption by up to **30%** in commercial buildings.

Extreme events

CSIRO-BoM Access model every day delivers a **10x** improvement in weather forecasts.

$200 million in costs avoided for coastal communities through better planning and zoning underpinned by CSIRO science.

Water



Murray-Darling Sustainable Yields saved an estimated **$2.8 billion** in better risk management.

Pipeline Asset and Risk Management System maximises efficiency and minimises supply disruption in our big cities.

Services

Four billion devices worldwide use the CSIRO technology that underpins current high-speed wireless local area networks (WLANs).

Ngara technologies bring wireless broadband communications to rural and regional Australia.

Manufacturing

Focus Night and Day™ and **O2OPTIX™** extended wear contact lenses developed in collaboration with Vision CRC and CIBA Vision Corporation.

Assisting a family-owned manufacturing company, Textor Technologies, to consolidate its position as a key supplier of specialised fluid transfer fabrics to the **global market**.

Health

Hendra virus vaccine developed and brought to market.

Early detection of Alzheimer's could improve quality of life for **thousands** of Australians.

BIOSECURITY FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

In 2012–13 CSIRO established the Biosecurity Flagship to focus its effort on protecting Australia from pest and disease threats resulting from the increase in global trade and the movement of animals, plants and people. Combined with a changing climate, which can alter the magnitude or range of impacts from pests and diseases, and declining levels of expertise and resources in biosecurity research, these pressures will only continue to increase in the future.

OUR RESPONSE

The Flagship's multidisciplinary research spans animal, plant and environmental domains to more rapidly develop solutions to address Australia's major biosecurity challenges. It involves the detailed study of invasive organisms, exotic, emerging and established pests and diseases, risk analysis, predictive modelling and new tools and treatment strategies.

Seventy per cent of emerging infectious diseases in humans originate in animals. To address this, the Flagship is applying a One Health approach to better characterise animal/human interactions and infectious disease management solutions.

The Flagship and CSIRO's Australian Animal Health Laboratory (AAHL), together with Duke-NUS (an alliance between Duke University in North Carolina, USA and the National University of Singapore), have formed the International Collaborative Centre for One Health. This partnership will bring a better understanding of how viruses emerge and the development of new preventative and diagnostic tools, as well as new therapeutics and vaccines.

OUR PATHWAY TO IMPACT

The provision of new technologies in the form of sensors, sensor networks and autonomous platforms for more cost-effective surveillance of both terrestrial and marine environments will provide early warning of new incursions. New genetic technologies and precision genome engineering will be deployed to develop disease resistant livestock, while diagnostics, vaccines and novel therapeutics add to the range of options to protect animal and human health. Additionally, the Flagship will provide highly effective options to manage invasive species through biological control. The Biosecurity Flagship builds on past successes, bringing scale and connectivity to help prepare for and prevent the spread and impacts of pests and diseases.

BIOSECURITY FLAGSHIP ROADMAP[17]

THEME	1–3 YEARS	4–9 YEARS	10+ YEARS
Animal biosecurity	Innovations to combat emerging and infectious diseases, for example vaccines and therapeutics.	Precision genome engineering used to develop broader options for disease resistant livestock.	Predictive virology gives enhanced capacity to pre-empt emerging infectious disease.
Biosecurity and invasive species	Characterise risks, pathways, potential impacts, cost-effective response options and policy adjustments for high priority invasive pests and diseases.	Deployment of enhanced surveillance systems for terrestrial and marine ecosystems, new treatments to ensure market access and greater integration of human behaviour in biosecurity planning and delivery.	A responsive, resilient biosecurity system based on coordinated policy, new technologies for surveillance and pre-emptive response.
One Health	Focus on a One Health approach for emerging infectious diseases and establish partnerships with key international collaborators.	Outcomes for national and international threats of emerging diseases delivered through multidisciplinary skills in advanced animal and human health technologies.	An improved and established global network of coordinated research to support Australia and the world to reduce the risk of pandemics and enhance preparedness.

▲ CURRENT POSITION

17 The Biosecurity Flagship was formed on 1 July 2012, a comparison to previous year, therefore, is not possible.

FLAGSHIP GOAL: To support Australia's social, environmental and economic wellbeing by reducing the risk of pest and diseases and improving the effectiveness of mitigation and eradication responses.

▷ Vaccine to boost the frontline fight against Hendra virus

On 1 November 2012, Australian horse owners and the equine industry received an important boost in their fight against the deadly Hendra virus with the introduction of Equivac® HeV vaccine.

Scientists at CSIRO's AAHL, working in close partnership with Zoetis Australia (formerly Pfizer Animal Health) and two organisations from the USA, the Uniformed Service University of the Health Sciences and the Henry M Jackson Foundation for the Advancement of Military Medicine, played a critical role in developing the Equivac® HeV vaccine. This vaccine is the first commercial vaccine for a Bio-Safety Level-4 disease agent, the most dangerous disease agents in the world. AAHL is the only laboratory in the world equipped for this type of large-animal research.

A recent Biosecurity Flagship study has shown that the Equivac® HeV vaccine protects horses for at least six months. In March 2013 CSIRO scientists confirmed that horses were immune to a lethal exposure of the Hendra virus six months post-vaccination. Stopping the virus in horses will help prevent transmission of the virus from horses to people. Our researchers believe protection is likely to persist for longer than six months, and studies are continuing to confirm this and other key indicators of the vaccine's performance.

The Hendra virus, like 70 per cent of all emerging infectious diseases over the past two decades, is an infection transmitted from animals to people. With no known cure, the Equivac® HeV vaccine is set to become the most effective defence against this disease.

Effective prevention of the Hendra virus will save lives and reduce significant expense for the government, the equine industry and the community. Reducing or eliminating outbreaks reduces the chances of the Hendra virus mutating into a form that more readily spreads from human to human. This should serve to minimise the future impact of the Hendra virus in Australia.

Ongoing research into the diagnosis, prevention, exclusion, eradication, and control of infectious diseases will deliver significant benefits to the health, safety and financial wellbeing of the Australian community.

The first horse to receive the Equivac® HeV vaccine from veterinarian, Dr Nathan Anthony.
Image: Julien Star Photography

CLIMATE ADAPTATION FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Over the last two years, extreme climate events across Australia have highlighted the need to be better prepared to manage escalating climate risks into the future. In 2012–13, the Flagship worked in partnership with governments, industry and the community to deliver practical options and solutions to these extreme events.

OUR RESPONSE

This year the Flagship released two major reports, one for the Australian Government and one for the Queensland Government on the impacts of climate change on biodiversity, which highlighted the need for new strategies to address biodiversity conservation. The second Marine Report Card for Australia was released for use by government departments, which provided information about the current and predicted-future state of Australia's marine climate.

In 2013 CSIRO also initiated a major collaboration with universities across Australia, focusing on innovative design and construction processes of buildings and infrastructure. Engineering solutions to better protect infrastructure against extreme weather events due to climate change will be important for the resilience of our cities and coasts.

OUR PATHWAY TO IMPACT

The Flagship also completed major projects for the Department of Agriculture, Fisheries and Forestry on how primary industries can adapt to climate change. In various farming systems around Australia, changing the enterprise mix and deploying new farming practices can, and are, being used to manage the early impacts of climate change. For example, 'climate ready crops' have demonstrated the potential for breeding heat and drought tolerant crops such as wheat and sorghum.

Our research findings from projects such as the Indian Ocean Climate Initiative, a partnership between CSIRO and the Bureau of Meteorology, are being used by local governments in water management infrastructure and planning, management of landscapes and in emergency management. This work was funded by the Western Australian Government.

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.

2011–12 POSITION ▲ ▲ CURRENT POSITION

FLAGSHIP 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 $3 billion per annum in net benefits by 2030[18].

▷ Benefits of effective coastal planning

Storm surge inundation caused by extreme weather conditions varies greatly both within and between coastal communities. It is a significant risk in south-east Queensland, where 200,000 people would be at risk from a one-in-100-year storm tide. This risk increases as the population grows and sea levels rise. If coastal communities are to protect themselves against these current and future risks they need to adapt and make decisions about how to manage coastal inundation.

To address these challenges, CSIRO researchers produced a model of the costs and potential benefits of a range of adaptation options that could improve some or all of the effects of coastal inundation events. These options ranged from constructing sea walls, redesigning infrastructure, such as raising floor heights of buildings or restricting development of areas likely to be affected by storm surges.

Although risk of storm inundation is generally widespread, costs and benefits will vary from place to place within the community, and some people will benefit more than others from different adaptation options. This has an impact on community support for these options. CSIRO's model allowed researchers to identify different types of communities and the options that best suited them in terms of affordability, fairness and potential return on investment.

Making informed decisions about whether adaptation options should be considered for the community, individual properties, or not at all, means that local councils can plan their infrastructure accordingly. Enhanced local government planning and zoning using CSIRO research is forecast to save at least $200 million for coastal communities in south-east Queensland by 2030.

King tide event at Shorncliffe 2009. Image: © Andrew Higgins

18 The Flagship goal was modified in 2012 in response to the strategic review undertaken.

DIGITAL PRODUCTIVITY AND SERVICES FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Officially opened in July 2012, this Flagship builds on existing relationships with the Australian eHealth Research Centre, the Australian Centre for Broadband Innovation and the Human Services Delivery Research Alliance. Through the application of ubiquitous broadband-supported services and technology, our contribution to the Nation's Research Priorities include a more effective health sector, an increase in economic productivity and enhancements in information security.

OUR RESPONSE

The Flagship takes advantage of increasingly widespread availability of broadband connectivity to enable significant increases in productivity, social inclusion and personalisation. This ultimately leads to changes in the way people engage with technology, experience the world and make evidence-based decisions.

OUR PATHWAY TO IMPACT

The Patient Admission Prediction Tool (PAPT) is creating an economic and social impact in Queensland hospitals by reducing waiting times for patients and making use of available beds more efficient. New telehealth projects utilising high-speed broadband are also enabling CSIRO and its partners to deliver tele-opthalmology services to more than 900 patients living in remote regions, and home-based health services to over 150 chronically-ill patients around Australia (more on page 27).

Our Early Adopters Group for social media monitoring (SMM) creates a means to crowd source information in a meaningful and reliable manner. These tools help governments in many ways, from understanding the impact of policy changes to enhancing awareness in emergency situations. The Flagship is also helping to add digital technology to educational tools with our new museum tele-presence robots. The tele-presence system trial currently allows school students to take a virtual tour of the National Museum of Australia in Canberra.

CSIRO's own high-speed wireless backhaul system (called Ngara) has successfully been commercialised via a license to Queensland company EM-Solutions, while our 3D laser mapping technology (licensed to UK company 3D Laser Mapping) now creates super-accurate 3D models of mines to significantly improve planning and increase efficiencies in these mines.

DIGITAL PRODUCTIVITY AND SERVICES FLAGSHIP ROADMAP[19]

THEME	1–3 YEARS	4–9 YEARS	10+ YEARS
Government and commercial services	Superannuation Cluster established. SMM in 30 agencies. The Department of Human Services saves $200 million per annum.	SMM 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 10 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.

▲ CURRENT POSITION

19 The Digital Productivity and Services Flagship was formed on 1 July 2012, a comparison to the previous year, therefore, is not possible.

FLAGSHIP 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.

▷ Improving patient care and reducing waiting times

Hospital emergency departments are often critically overcrowded and struggle to respond to day-to-day arrivals in a timely manner. To assist hospitals with this challenging issue, researchers from CSIRO's Digital Productivity and Services Flagship developed the Patient Admission Prediction Tool (PAPT), a software tool that uses historical data to predict, with around 90 per cent accuracy, how many patients will arrive at emergency departments and when. PAPT also predicts a patient's medical needs and urgency of care and how many patients will be admitted or discharged.

The system is being used by the Queensland Government and is available in all 27 major hospitals across the state. It has the potential to save $23 million per annum in improved service efficiency for the Australian health system.

Currently, public hospitals across Australia have been set targets to reduce emergency waiting times to four hours by 2015. PAPT is allowing hospital staff in Queensland hospitals to cut patient waiting times by accurately forecasting the demand on hospital resources, while ensuring patients receive timely access to emergency care and a hospital bed. Flagship researchers developed PAPT at the Australian eHealth Research Centre in Brisbane in a partnership between CSIRO, Queensland Health, Griffith University and the Queensland University of Technology.

Throughout its trial, PAPT has shown vastly improved prediction rates of patient arrivals and admission in both large and smaller hospitals. Hospitals have benefited from using this technology via improved availability of beds, better staff resourcing and more efficient scheduling of elective surgery. For patients, the system has delivered improved personal health outcomes via the timely delivery of emergency care, improved quality of care and reduced time spent in hospital.

By expanding the PAPT system to other state health departments, the Flagship will help deliver improved patient care and greater access to emergency services, elective surgery and other healthcare services through more accurate forecasting of demand on hospital resources. The potential value of improved patient outcomes (e.g. reduced mortality) once fully implemented is $97 million per annum across Queensland and well over $248 million per annum Australia-wide.

CSIRO's Patient Admission Prediction Tool vastly improves prediction of patient presentations and admissions at emergency departments across Queensland.

ENERGY TRANSFORMED FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

The Energy Transformed Flagship responds to the global challenge of climate change and seeks to enable the transformation of the energy and transport sectors to provide secure, affordable energy to Australia while reducing emissions.

OUR RESPONSE

To meet these challenges, the Flagship focuses on large-scale, applied, multidisciplinary research and development. Our projects include concentrated solar thermal technologies for power and fuel production, energy storage to support renewable energy use, solar forecasting to improve industrial scale predictions of solar energy outputs, aviation biofuels and social science focused on community adoption of energy efficiency technologies and future technology acceptance.

In July 2012, the most comprehensive assessment to date of Australia's ocean energy resources was released. Together with the Wealth from Oceans Flagship, the Flagship found that energy captured from the motion of waves could supply around ten per cent of Australia's electricity by 2050. This could power a city the size of Melbourne.

Coinciding with the Australian Government's Energy White Paper in November 2012, the Flagship launched '*efuture*', an interactive website that explores energy scenarios presented in the paper and what those energy pathways for Australia could mean for technology development, the economy and the environment.

OUR PATHWAY TO IMPACT

During November 2012, the Flagship was reviewed by a committee of international leaders from the science and business community. In all areas the Flagship was considered to be internationally competitive amongst the global research community, with some areas such as our industry-focused future forums and our licensed energy management system (OptiCool), recognised as world-leading.

ENERGY TRANSFORMED FLAGSHIP ROADMAP

THEME	1–3 YEARS	4–9 YEARS	10+ YEARS
Carbon futures	Develop models and reports to inform policy, industry and research. Undertake social attitude mapping. Hold stakeholder energy forum.	Hold transport sector stakeholder forums. Undertake longitudinal and larger population social analysis studies; commercialise software. Initiate integrated carbon assessment service.	Deploy an integrated energy, water, food and carbon assessment service to help Australia identify the least cost and risk transition pathways to a prosperous and secure low carbon future.
Sustainable stationary energy and transport	Develop technologies for low-cost solar power production and energy storage. Prioritise potential fuel crops for large-scale, sustainable biofuels production.	Demonstrate significant technologies at pilot-scale, with industry and government support.	Drive the cost-effective take-up of renewable electricity and transport fuels in Australia to 2020 and beyond and maximise the long-term renewables uptake to 2050.
Local energy systems	Develop low-emission distributed energy technologies. Identify and begin engagement with partners.	Develop distributed generation and efficient options model to inform government and industry. Commercialise technologies.	Reduce greenhouse gas emissions by driving the uptake of distributed energy solutions, demand reduction and energy efficiency measures to 2020.

2011–12 POSITION CURRENT POSITION

FLAGSHIP GOAL: To develop, demonstrate and ensure deployment by 2020 of integrated low-carbon pathways for Australia and alternative stationary and transport energy solutions that realise a reduction of Australia's carbon dioxide equivalent emissions greater than 20 million tonnes per annum by 2030, and greater than 50 million tonnes per annum by 2050.

▷ Harnessing Australia's most abundant energy source: the sun

The Energy Transformed Flagship has invested in the largest solar thermal power research capability in the southern hemisphere and is currently delivering more than $150 million worth of solar thermal projects for industry and government, in collaboration with some of the best companies, universities and research agencies in the world.

Solar thermal technology uses mirrors or lenses to concentrate sunlight. This sunlight is converted into heat to drive a turbine connected to an electrical power generator or for integration into industrial processes such as fuel production. The resulting solar power has low-to-zero carbon emissions and the research team aims to make the price competitive with fossil fuels in the future.

In December 2012, a joint collaboration with the Australian Government's Australian Renewable Energy Agency was announced, with the Flagship leading the $87 million Australian Solar Thermal Research Initiative (ASTRI). The collaboration includes eight national and international research partners and is the largest Australian solar thermal, or concentrating solar thermal power collaboration and investment to date. ASTRI aims to reduce the cost of solar power by half (down to 12 cents a kilowatt-hour) and, by developing storage, allow solar power to supply the grid with electricity on demand.

During the reporting year, the Flagship collaborated with General Electric to further develop the Flagship's SolarGas™ technology and its transition to commercialisation. SolarGas™ combines natural gas with solar power to create a fuel that is 25 per cent more powerful than natural gas. This fuel can be burnt to produce electricity with lower carbon emissions than natural gas or can be turned into a transport fuel.

In the first half of 2013, the Flagship commissioned the world's first solar-powered high temperature steam receiver, which may assist coal-fired power stations transition to an increasing share of solar energy. Coal-fired power stations across Australia currently use steam to power turbines to generate electricity and the introduction of a solar receiver could one day be a retrofit option that will use a free energy source (the sun), reduce carbon emissions and decrease our reliance on fossil fuels.

The Flagship's international solar expert, Wes Stein, with members of the solar executive committee from the International Energy Agency during their annual meeting at the CSIRO Energy Centre, April 2013. Image: Newcastle Herald

FOOD FUTURES FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

The Australian agrifood sector is facing the challenge of meeting a globally increasing demand for food with limited land and resource use, and an additional need for optimal nutrition of food products.

OUR RESPONSE

In 2012–13 the Flagship worked on new grains that provide nutritional benefits for bowel and heart health, and diabetes prevention. Flagship scientists also developed a more accurate technique to quantify gluten in foods, which will add certainty to food choices for those with gluten intolerance.

To support Australia's Atlantic salmon industry, researchers identified a gene marker for determining the sex of immature Atlantic salmon, which is vital in warm Tasmanian waters where only female salmon produce high-quality meat.

In livestock breeding, the Flagship has partnered with the cattle industry and the Queensland Alliance for Agriculture and Food Innovation to apply genomic technology to breed cows that have more offspring, making tropical beef farming more productive.

To preserve food quality and contribute to food security, Flagship researchers have used our biosensor technology to achieve early positive results in detection of a fungal toxin that affects maize stores globally.

OUR PATHWAY TO IMPACT

CSIRO-developed BARLEYmax™ grain, which has been proven to be beneficial for bowel health and maintenance of healthy blood sugar levels, is now more accessible to consumers as it is available in 11 food products, including a rice blend and loaf bread.

Research to understand genes in wheat has given researchers around the world a new tool to use to identify and test for genes related to desirable traits like adaptation to climate conditions or disease resistance, helping to develop better wheat to increase productivity for farmers.

The aquaculture industry was supported through industry partnerships for selective breeding of Pacific oysters, abalone, black tiger prawns and Atlantic salmon (more on page 31). The programs have all achieved greater than ten per cent gains in growth per generation, which has increased aquaculture 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[20]	Animal management systems adopted and breeding technology developed with commercial partners.	Livestock industry adoption of genomic technology, 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	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.

2011–12 POSITION ▲ ▲ CURRENT POSITION

20 The Breed Engineering Theme roadmap has changed to reflect the broader applicability of the technology.

FLAGSHIP 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.

▷ Super salmon

CSIRO's selective breeding program for Atlantic salmon now supports 70 per cent of commercially-produced Atlantic salmon in Australia. The Flagship achieved this through a successful seven-year partnership with Salmon Enterprises Tasmania (SALTAS), Australia's leading Atlantic salmon hatchery.

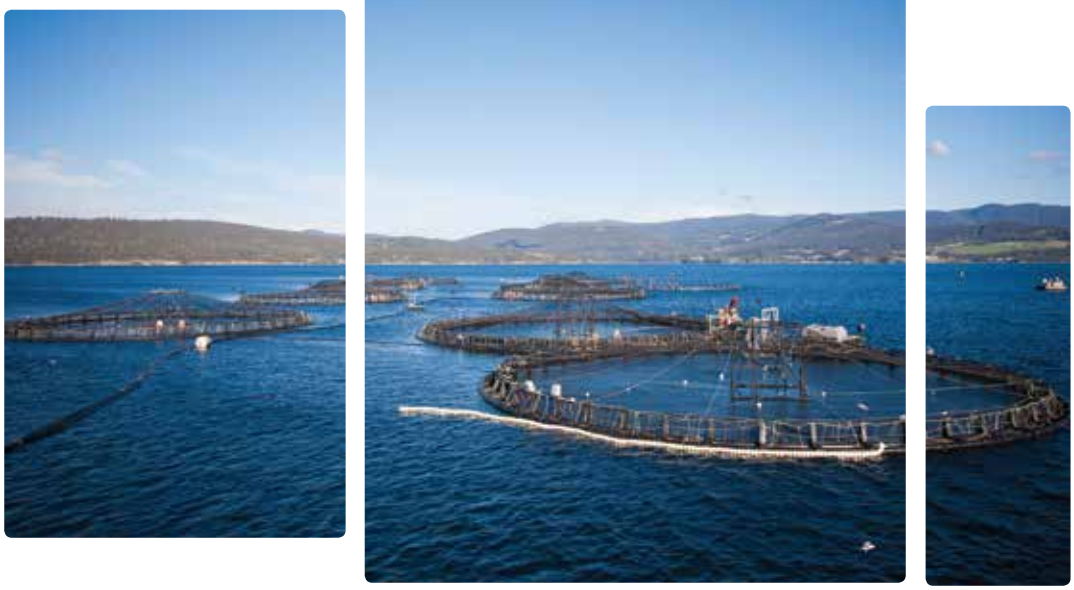
The objective of this science-industry partnership was to support the sustainable growth of the $400 million local industry by developing an elite pool of Atlantic salmon bloodlines that resulted in faster-growing, healthier fish.

Throughout the partnership, the Food Futures Flagship screened the DNA of tens of thousands of salmon to identify high-performing bloodlines, resulting in a selective breeding program that has successfully bred for increased growth rates and disease resistance.

Salmon from the breeding program demonstrated greater than ten per cent gains in growth in every generation. This increase in growth is expected to continue with the industry on a trajectory to double production by 2030. A ten per cent improvement in growth equates to production efficiencies worth in excess of $50 million a year, increasing the global competitiveness of the industry. In 2013, the partnership was extended for a further seven years, providing even greater opportunity to deliver significant gains to the industry.

This selective breeding program has provided the farming companies with the ongoing capacity to select salmon bloodlines to meet changing environmental or market conditions, underpinning the long-term success of the industry.

While other salmon breeding programs exist elsewhere in the world, the Tasmanian program is the first to use resistance to amoebic gill disease (AGD) as a selection criterion. AGD results from a species of amoeba that attaches to the gills of salmon. While these salmon are safe to eat, managing AGD is estimated to cost the industry $40 million a year in treatment and lost productivity. CSIRO's research has the potential to help global salmon production as AGD is now emerging as a significant health issue in commercial salmon populations in Scotland, Ireland and Norway as water temperatures increase.



CSIRO's selective breeding program now supports 70 per cent of Atlantic salmon produced in Australia. Image: Richard Jupe

FUTURE MANUFACTURING FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Australian manufacturers are facing significant challenges to remain globally competitive. Companies need to improve productivity, produce more from less and build competitive sustainability. Consumers are demanding new products and services that are more environmentally friendly while reducing our carbon footprint.

OUR RESPONSE

The Future Manufacturing Flagship (FMF) partners with manufacturing firms to develop technologies that help them enhance productivity, build sustainability and respond more rapidly to the demands of emerging markets.

In 2012 the FMF grew its investment in agile manufacturing technologies to assist companies develop the agility and speed with which they can bring new products to market. The Flagship also commissioned a new additive manufacturing machine – the first of its kind in the southern hemisphere. It will be used to develop advanced titanium parts for aerospace, medical and automotive applications.

OUR PATHWAY TO IMPACT

The Flagship's topcoat reactivation technology (Paintbond) is being used across multiple civil and military aircraft, winning the prestigious '2012 Boeing Technology Replication Award'. Paintbond has been successfully transferred to Boeing and used across Boeing's entire commercial aircraft line – over 1,000 aircraft recoated using Paintbond, resulting in multi-million dollar savings.

Additionally, our work with Textor Technologies and Kimberly-Clark helped bring an advanced ultra-absorbent material to market in their new range of newborn nappies (more on page 33).

In May 2013, the Flagship, in partnership with The University of Melbourne, Monash University and industry, launched a new solar cell printing facility. This facility is a significant step towards growing new industry capability in large-scale production of printed solar cells and flexible electronics with potential applications in consumer electronics, signage and construction.

FUTURE MANUFACTURING FLAGSHIP ROADMAP

THEME	1–3 YEARS	4–9 YEARS	10+ YEARS
Manufacturing technologies for transport and mining[21]	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.
Flexible electronics	New materials discovery, device prototype optimisation and 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.
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.
Sustainable high performance materials[22]	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[23]	Develop and demonstrate the applicability of Information and communication technology (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.

2011–12 POSITION ▲ ▲ CURRENT POSITION

21 The Advanced Engineered Components Theme has been realigned to form the Manufacturing Technologies for Transport and Mining Theme.

22 The Advanced Fibrous and Protective Materials and Sustainable Materials Themes were merged to form the Sustainable High Performance Materials Theme.

23 The Agile Manufacturing Technologies Theme was formed on 1 July 2012.

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.

▷ Australian innovation revolutionises nappy market

Textor Technologies is a Victorian, family-owned company producing an array of products used in healthcare, personal hygiene and industrial products. The hygiene product market is a highly competitive, multi-billion dollar consumer-focused industry.

Every year in Australia 300,000 babies enter the $500 million nappy market with over 40 per cent born to first-time mums. Working with Textor Technologies and multinational Kimberly-Clark, CSIRO helped develop a new three dimensional (3D) material that increases nappy absorbency.

Launched in March 2013, Huggies Newborn Infant Nappies featured this new material, known as the 3D UltraAbsorb layer. The material absorbs and contains babies' runny bowel movements, minimising spread within the nappy. CSIRO worked with Textor Technologies through the Researchers in Business (RIB) Program which places scientists into businesses to help accelerate product development and innovation. As part of the RIB Program a CSIRO scientist helped Textor Technologies and Kimberly-Clark develop this next-generation nappy.

Kimberly-Clark experienced excellent results in consumer research with parents of newborn babies consistently impressed with the difference the new UltraAbsorb layer makes, with seven out of ten mums saying they prefer the new nappy. Aligned with an ongoing strategy of open innovation and working hand-in-hand with industry in Australia, the material is a first-of-a-kind super-absorbent soft material. The development of this product is an example of how the innovation process works by linking researchers, such as CSIRO through the RIB Program, to small-to-medium enterprises. Concepts are developed which are then linked to multinational enterprises so they can be taken to market via the multi-nationals' supply chains.

CSIRO's involvement with Textor has helped to improve their manufacturing processes by applying smart technology to improve efficiency, which has contributed to a significant increase in their annual gross turn over.

(L to R) Textor Technologies' Andy Butler and Phil Butler with CSIRO's Dr Niall Finn (middle) at Textor's Tullamarine premises in Victoria. The partnership has seen the development of a new 3D material that increases nappy absorbency.

MINERALS DOWN UNDER FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Globally, the minerals industry is operating in an increasingly challenging environment. In 2012–13, lower and more volatile metal prices, declining ore grades, increasing production costs, environmental pressures and mounting competition affected the industry.

OUR RESPONSE

The Flagship continued its focus on productivity and environmentally friendly technologies that will maintain Australia's competitiveness. With partners Direct Nickel, a pilot plant was launched to test a new processing method for nickel laterites that has lower capital costs, energy consumption and operating costs than traditional methods. It could unlock two-thirds of Australia's nickel resource.

In mining, a trial of our large-scale ore sorting sensor commenced at a Newcrest mine in New South Wales. It could improve the mine's efficiency by 20 per cent, decrease its annual carbon dioxide emissions by 33,000 tonnes and reduce water consumption by 15 per cent.

The Mineral Futures Flagship Collaboration Fund Cluster, a partnership with five Australian universities, provided recommendations for the sustainability of the minerals sector and the Australian economy, which included the need for a national strategy for management of Australia's resources.

OUR PATHWAY TO IMPACT

The Flagship is deploying a suite of sensing technologies that optimise process performance. The Acoustic Emission Analyser was deployed at a plant in Queensland. By monitoring machine noise it allows operators to rapidly respond to changes in machine conditions, maximising efficiency, minimising downtime and saving money.

The Flagship and partners released the world's first continental-scale suite of maps that reveal the mineralogy of the Earth's surface. Mining companies use the maps to increase the efficiency and viability of exploration efforts, and Kentor Gold has used them to define drill targets in an area of high potential for gold and copper.

MINERALS DOWN UNDER FLAGSHIP ROADMAP[24]

THEME	1–3 YEARS	4–9 YEARS	10+ YEARS
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.
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 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.
Australia's mineral futures	Assess the implications of plausible futures for the industry to 2040.	New planning tools to support social licence to operate.	Social negotiation tools embedded in technology and project development.

2011–12 POSITION ▲ ▲ CURRENT POSITION

24 As of July 2013, the MDU Flagship Roadmap changed in structure to reflect the Flagship's strategy, bringing together a number of activities in fewer themes.

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.

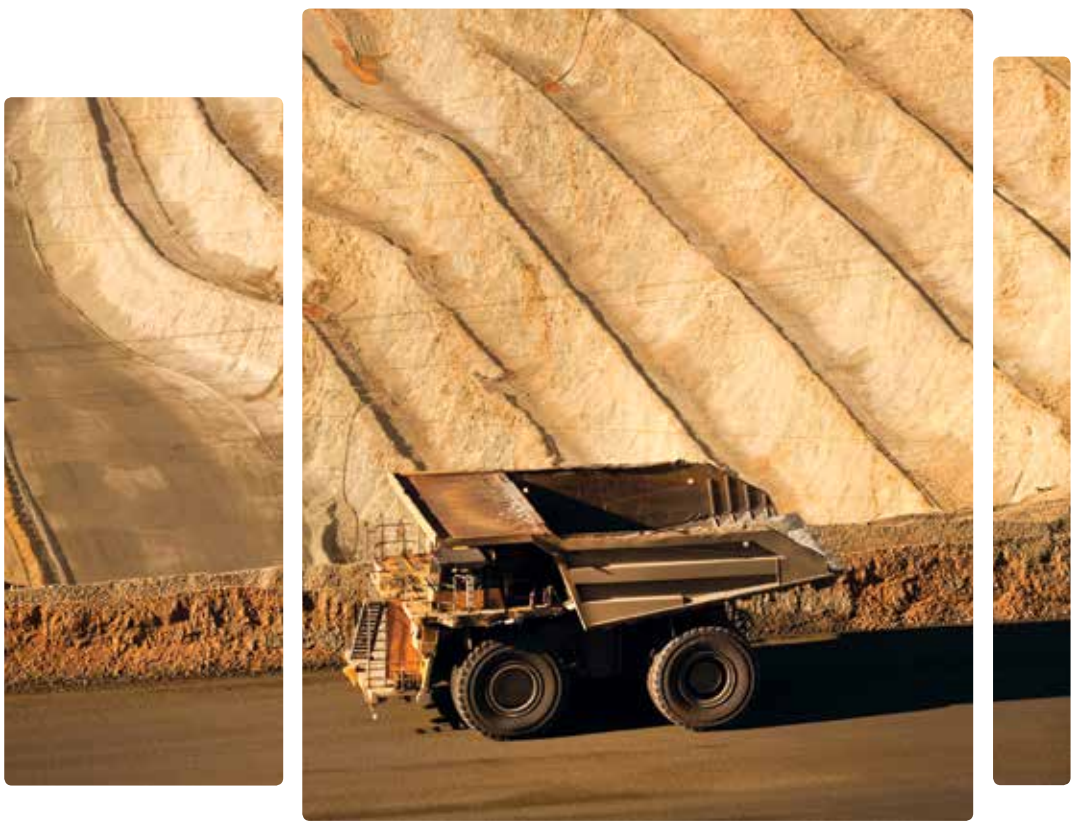
▷ Setting the standard for open pit mines

Following years of ongoing research into the stability of rock slopes, the Minerals Down Under Flagship has helped redefine large open pit mine design, ensuring mine slopes are reliable. This research is minimising loss of life, equipment damage and sustained production losses in the event of mine slope failure.

The Flagship has addressed an industry-wide need for improved knowledge and understanding of the relationship between the strength and deformability of rock and the likely mechanisms of failure in large open pit mines.

Sponsored by 13 mining companies representing the majority of the world's diamond and base metals producers, this work has changed the way the mining industry approaches open pit design. By bringing together engineers from mining houses around the world, the Flagship was able to build a common ground in critical design and implementation issues at minesites.

CSIRO's *Guidelines for Open Pit Slope Design* handbook provides best practice guidance around how to maximise safety, ore recovery and financial return for the required life of the mine. The book links innovative geomechanics research with best practice in open pit data collection and management, slope design, mining, slope management and monitoring, and risk management. It arms mining companies with a high-quality baseline for the geotechnical programs at their mines. This work has made mines safer, more productive and cost-effective.



CSIRO's Minerals Down Under Flagship has helped redefine large open pit mine design, ensuring mine slopes are reliable. Image: iStock Photo

PREVENTATIVE HEALTH FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

During the reporting year, the Preventative Health Flagship focused on validating blood-based biological markers for the early detection of Alzheimer's disease and colorectal cancer. Alzheimer's disease progresses slowly before clinical symptoms are apparent making it difficult to diagnose, and Australia's incidence rates for colorectal cancer, inflammatory bowel diseases and being overweight or obese are amongst the highest in the world.

OUR RESPONSE

The Flagship is continuing to advance the development of two blood-based tests for the early detection of colorectal cancer. Detecting colorectal cancer early is critical, as surgery is a highly effective cure. This year our gene-based colorectal cancer diagnostic blood test is closer to being available on the market, with licensing arrangements currently under negotiation with commercial partners.

Additionally, Flagship scientists are examining microbes in the gut to build a better understanding of Crohn's disease, an inflammatory gut condition that is highly debilitating and has no reliable cure. CSIRO and partners are also investigating the nutrition and lifestyle of mothers during pregnancy, to understand how epigenetic[25] changes and environmental factors may influence the risk of obesity later in life.

OUR PATHWAY TO IMPACT

CSIRO and its Australian Imaging, Biomarkers and Lifestyle (AIBL) partners are developing diagnostic tests for the early detection of Alzheimer's, and are exploring clinically-validated dietary approaches to delay the progression of the disease. Working with our partners, Flagship scientists discovered that the earliest signs of Alzheimer's are apparent more than 17 years prior to the onset of dementia. This window provides an opportunity for lifestyle and pharmaceutical companies to intervene early, before irreversible brain damage has occurred.

The Flagship is also working with commercial and research partners to translate our clinical studies into the broader community, to achieve healthier body weights and improved health.

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[26]	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.

2011–12 POSITION ▲ ▲ CURRENT POSITION

25 See glossary page 193.

26 The obesity and metabolic health theme re-joined the Flagship from the Animal, Food and Health Sciences Division, previously known as the Food and Nutritional Sciences Division before the merger with Livestock Industries. The neurodegenerative diseases theme changed to brain health on 1 July 2012.

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.

▷ One step closer to a blood test for Alzheimer's

One quarter of a million Australians currently suffer from dementia and, given our ageing population, it is predicted that this will increase to one million by 2050, with Alzheimer's accounting for 50–70 per cent of dementia cases. If Alzheimer's can be detected early, new treatments could be developed and prescribed to slow the progression of the disease before irreversible brain damage has occurred.

CSIRO and partners are much closer to developing a blood-based screening test for the early detection of Alzheimer's disease. Scientists used sophisticated mathematical models to analyse data from participants in the AIBL study of the ageing. They identified nine biological markers that correlate with brain imaging measures of a toxic protein, amyloid beta, which deposits itself in the brain as plaques early in disease development. Recent studies from the AIBL team have shown that amyloid beta levels become abnormal about 17 years before symptoms appear.

Current screening methods for amyloid beta levels are expensive or require invasive procedures to collect biological samples. With continued research in this area, scientists hope to develop a low-cost population level screening test for Alzheimer's disease. A blood test would be an ideal tool, identifying people at risk before diagnosis is confirmed through more specialised testing.

The AIBL study is a collaboration between Austin Health, CSIRO, Edith Cowan University, the Florey Institute of Neurosciences and Mental Health and the National Ageing Research Institute. The study was supported by the Science and Industry Endowment Fund (SIEF).

Alzheimer's disease places significant economic and social challenges on the Australian community. Image: iStock Photo

SUSTAINABLE AGRICULTURE FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Throughout 2012–13, a key national challenge for the Sustainable Agriculture Flagship has been to further develop rural land use systems, practices and technologies that will deliver the greatest benefits to the Australian economy and society and contribute to major global issues of food security and greenhouse gas abatement.

OUR RESPONSE

During the reporting year, the Flagship established deep collaborations with external organisations and institutions, and developed multidisciplinary internal teams to address both the productivity and greenhouse gas challenges. Examples of this can be seen through recent research on improving yields for farmers through improved water use efficiency. The Flagship also completed a national analysis of soil carbon through the federal government's Soil Carbon Research Program to help increase the nation's understanding of the role soil can play in removing and storing carbon from the atmosphere. Additionally, a new collaboration with Google Earth is allowing land managers to access decades worth of images and information captured via satellite at the push of a button.

OUR PATHWAY TO IMPACT

Eighty-four countries around the world are now using CSIRO's co-developed Agricultural Production Systems Simulator known as APSIM, a tool that helps farmers make management decisions to help increase the amount of food and fibre they produce. The Flagship also developed CSIRO's first iPad application (app), SoilMapp, which has an average of 700 downloads per month (more on page 39).

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.

2011–12 POSITION ▲ ▲ CURRENT POSITION

FLAGSHIP GOAL: To secure Australian agriculture and forest industries by increasing productivity by 50 per cent and reducing carbon emission intensity by at least 50 per cent between 2010 and 2030.

▷ SoilMapp for iPad: soil information at your fingertips

Helping farm and land managers make the best decisions possible was at the forefront of the minds of the developers of CSIRO's first mobile application (app).

The new app for iPad, called SoilMapp, was released in January 2013 and is helping farm advisors, researchers, land managers and others interested in soil to access the best information Australian scientists have to offer. SoilMapp is the first app developed by CSIRO researchers, information and communication specialists and was developed with an active group of agricultural consultants to ensure it delivers the kind of information particularly needed by farmers and land managers.

With more than 2,600 downloads to 30 June 2013, SoilMapp allows users to see what kind of soil is most likely under their feet. They can access information on soil depth, acidity, salinity, carbon and water holding capacity. Users can also explore data and photos from soil sampling done nearby and save soil water information to their own online database.

SoilMapp taps into the Australian Soil Resource Information System and ApSoil, the database behind the farming systems model known as the Agricultural Production Systems Simulator, which is used in 84 countries worldwide.

The databases contain information from approximately 85,000 samples in 15,000 locations, some dating back to the 1950s. Contributions have been gathered from thousands of individuals, soil research groups, industry groups and the Australian Government, state and territory agencies.

As soil is essential for sustaining healthy, natural environments and productive agricultural landscapes, by making this information available and accessible, CSIRO is contributing to national and global efforts to produce more food with less environmental impacts.

The app was developed under the Australian Collaborative Land Evaluation Program and CSIRO Sustainable Agriculture Flagship, with funding from the Grains Research and Development Corporation. While currently only available in Australia, CSIRO is exploring possibilities to release SoilMapp globally.

Farmers and land managers can use the SoilMapp app for iPad to learn more about what is beneath their feet.

WATER FOR A HEALTHY COUNTRY FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Water security is a global issue, affecting both the developed and the developing world; it is fundamental to human development and international security. In Australia, population growth, a drying climate in southern Australia and land use change have pushed many river systems and water storages beyond their limits, threatening water security and creating major challenges for water managers, industry, policy makers and for the Australian community.

OUR RESPONSE

CSIRO is addressing these challenges through an integrated and multidisciplinary research approach and the establishment of strategic partnerships with government, industry and communities. The Flagship is delivering science-based knowledge to improve water management in regional and urban environments and to enable improved water security – at both national and international scales.

OUR PATHWAY TO IMPACT

In September 2012, the South Eastern Australian Climate Initiative, led by the Flagship and the Bureau of Meteorology, delivered its findings on the causes and predictability of climate variability and change and the impacts on water availability across south-eastern Australia, with adoption at both federal and state levels.

In 2012, the Water Information Research and Development Alliance (WIRADA), a partnership between CSIRO and the Bureau of Meteorology, delivered improved water accounting and forecasting information for use by the Bureau. WIRADA's Water ML2 international information exchange standard has been adopted by several national and international organisations, making it possible for governments to manage water resources that cross country borders.

The first fully-integrated assessment of south-east Queensland's water resources was completed through the South East Queensland Water Security Research Alliance. Results from this assessment are now informing infrastructure investment decisions in several Australian states and in the United States.

The Flagship's expertise in integrated river basin assessments is being extended to India, Pakistan and Bangladesh, where our research aims to strengthen water resources management, and support poverty alleviation and sustainable development. Much of this research is undertaken in partnership with the Australian Agency for International Development, AusAID.

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 resource management[27]	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[28]	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[29]	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.

2011–12 POSITION ▲ ▲ CURRENT POSITION

27 In July 2012 this new theme name changed in focus from data services only, to providing integrated basin-wide assessments.

28 From July 2012 this new theme name reflects a broader focus from purely ecosystem understanding to incorporating contaminants in ecosystems.

29 From July 2012 this new theme name reflects a move away from regional water management activities for rivers and aquifers to a more water assessment focus.

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.

▷ Filling the water knowledge gaps of the Great Artesian Basin

The Great Artesian Basin (GAB) is a 1.7 million square kilometres groundwater system and has been providing the only reliable source of fresh water for rural communities in Queensland, New South Wales, South Australia and the Northern Territory since the first bore holes were sunk in the 19th century.

But there are many questions about how the GAB works, and how new interactions between agriculture, mining and the water will impact long-term resource availability. To address these issues, the GAB Water Resource Assessment, led by CSIRO and Geoscience Australia, was completed in 2013. The assessment delivered the most comprehensive investigation to date of the Basin's water flows, physical structure, potential impacts of climate change and groundwater development to 2070.

The research revealed a surprising complexity of geological structures and their role in governing groundwater conditions; for example, the GAB and adjacent geological basins are separate reservoirs with different levels of connections to each other. This knowledge helps to paint a picture of how the resource is being used, and how much water is likely to be available in the future.

Extraction of groundwater (such as for mining and agriculture) requires continued observation to enable a better understanding of how the GAB will respond to future conditions.

The assessment will be an enduring asset to better inform government, community and industry decision-making. This research was funded by the Australian Government Department of Sustainability, Environment, Water, Population and Communities, and the National Water Commission.

The Great Artesian Basin, characterised by iconic springs, such as the Blanche Cup Mound Spring in outback South Australia, provides groundwater to four states.

WEALTH FROM OCEANS FLAGSHIP

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Australia's ocean is vast and largely unknown, but understanding our oceans and coasts is critical to Australia's future. Ocean-based industries contribute more than $42 billion annually to the economy. Oceans also drive the climate system; provide food, transport, and minerals, oil and gas resources; sustain biodiversity and regional economies; and offer recreational and lifestyle opportunities. Throughout the past year, the Flagship focused on building diverse and long-term partnerships with industry, government, research agencies and the community to deliver practical science for informed decisions about the sustainable management of Australia's marine and coastal resources.

OUR RESPONSE

In 2012–13, the Flagship, in collaboration with research agencies and industry, worked on a new Marine Water Quality Dashboard as part of the eReefs project. eReefs was formed in 2012 as the first step in building comprehensive coastal information systems for Australia. The new dashboard provides access to more than ten years of water quality information to identify changes over time. It also provides up-to-date assessments of the likelihood of coral bleaching events or the impact of sediment plumes from large rainfall events, and will be made available online once complete.

2013 also saw the maiden voyage for the Future Reef MAP project, a collaboration with Rio Tinto Alcan and the Great Barrier Reef Foundation, take place with a specially-built science laboratory installed on a Rio Tinto bauxite ship. The project enables a consistent, sustained approach to measuring vital signs of reef health along the same route in the Great Barrier Reef, and will help scientists determine how processes such as seasonal temperature change and major flood and storm events interact with longer-term changes in ocean acidification. The information and tools to be delivered by eReefs will benefit a range of stakeholders from reef managers, catchment management groups, and government policy makers to community groups undertaking citizen science on the Great Barrier Reef.

OUR PATHWAY TO IMPACT

With the *Atlas of Living Australia,* the Flagship also launched FishMap, a tool to assist management and sustainability of marine biodiversity. The tool enables users to discover which fish species live at any location or depth throughout the marine waters of Australia's continental shelf and slope. FishMap is the only resource of its kind in the world that covers virtually all species of fish found in the marine waters of an entire continent, pulling together over a century of research and making this major source of information available to managers, fishers, scientists and the broader public for the first time.

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.	National shelf-scale hydrodynamic model (BROWNlink) nationally implemented and used for oceanographic services.
Sustainable ocean ecosystems and living resources[30]	CSIRO R&D underpinning marine bioregional plans and National Representative System of Marine Protected Areas.	Adoption of CSIRO marine incident emergency response system.	Operationalisation of a National Ocean and Coastal Information System, as part of Australia's National Environmental Information System.

2011–12 POSITION ▲ ▲ CURRENT POSITION

30 This theme has two current positions – the 'R&D underpinning marine bioregional plans and National Representative System of Marine Protected Areas' work is currently positioned at the three-year mark, progressing simultaneously with the 'Adoption of CSIRO marine incident emergency response system' work.

FLAGSHIP 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.

▷ Science to inform offshore energy development and safety

Working with both industry and government, CSIRO is providing scientific knowledge, advice and services that are critical for the safe, efficient and sustainable use of Australia's marine wealth.

As part of a Collaborative Research Science Program with BP and Marine Innovation Southern Australia, CSIRO has begun early-stage exploration to look at depths largely unexplored in the Great Australian Bight. The Science Program is one of only a few whole-of-ecosystem studies undertaken in Australia, and will improve understanding of the environmental, economic and social value of the Great Australian Bight. It will provide vital knowledge to inform future decisions for sustainable development in the region.

CSIRO is also joining forces under a formal agreement, with the Australian Maritime Safety Authority (AMSA) to provide scientific knowledge and technical support for maritime environmental incidents, such as oil spills and shipping accidents. CSIRO's expertise and experience in maritime and marine science will serve AMSA's need for immediate advice during an incident response. This will ensure timely decisions can be made that help minimise impact, and monitor Australia's marine environment against oil spills, pollution or damage from a vessel collision or grounding.

Following up on work to help BP monitor the Deepwater Horizon oil spill in the Gulf of Mexico in 2010, CSIRO has been active in identifying naturally occurring hydrocarbon seeps in the same area. As part of a collaborative team, CSIRO was part of a three-vessel multidisciplinary survey attempting to map the hydrocarbon 'baseline' profile in the Gulf of Mexico. This same approach and technology has now been applied, in collaboration with Geoscience Australia, as an exploratory tool, to identify and locate natural hydrocarbon seeps in under-developed basins off Western Australia, which may eventually lead to a reassessment of the petroleum prospectivity for this area.

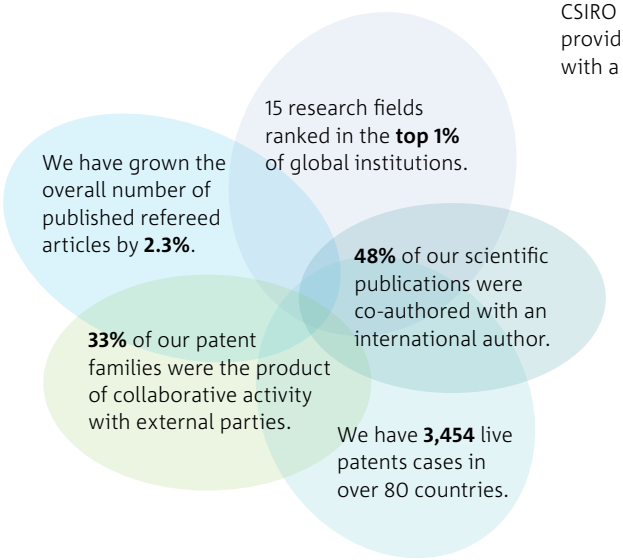
The hydrocarbon sensor equipment deployed from the back deck of the MV *Ryan Chouset* in the Gulf of Mexico.

PROGRAM 2
Core Research and Services

OBJECTIVES AND DELIVERABLES

CSIRO's core research and services improve industry, environment and community wellbeing across the breadth and depth of the National Innovation System through the provision of advice, information and solutions. This includes the delivery of new and improved technologies, managements systems, intermediate and finals products, catalyst services for business, advice relevant to policy development and new knowledge and skills. Our ability to deliver profound impact through our National Research Flagships is underpinned by investment in 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 15 for Program 1 National Research Flagships)

Each core research group is 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.



PROGRAM PERFORMANCE

This year, the Core Research and Services Program continues to perform well. Based on an assessment of the five Program key performance indicators (KPIs) identified in the Portfolio Budget Statements, CSIRO has met expectations and targets. Table 2.5 provides an overview of the evidence for each KPI with a more detailed analysis following the Table.

TABLE 2.5: PERFORMANCE INDICATORS

Key performance indicator	Target (and performance assessment)	Performance
The number of refereed Core Research publications	Maintain or increase	In 2012, CSIRO increased its high output of refereed publications from 2,768 in 2011 to 2,842 in 2012. CSIRO ranks 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).
Customer satisfaction	Maintained	See Program 1
Science excellence in CSIRO research capabilities as assessed through a rolling program of rigorous peer review	Maintain or increase	The third round of science excellence reviews commenced in October 2012 with the review of CSIRO Process Science and Engineering.
Demonstrated adoption and impact of core research outputs	Growing economic, social, environmental and intangible benefits	Evidence of adoption and impact of core research outputs for each of the Groups are reported on pages 54–63.

Green shading: indicates positive progress for the year and the target has been achieved. **Yellow shading:** indicates some challenges have occurred during the year, but they were managed. **Red shading:** indicates challenges have affected progress and resulted in the target not being achieved. **White/no colour:** indicates that this is the first year results have been recorded for this indicator therefore no trend can be observed.

SCIENCE EXCELLENCE AND HEALTH

CORE RESEARCH JOURNAL PUBLICATIONS

Indicator: The number of refereed Core Research publications.

The number of refereed journal articles produced by CSIRO, has been trending upwards over the last five years, with a three per cent annual increase between 2011 and 2012. While this increase is slightly below the previous years, it is still a satisfactory result.

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

Figure 2.12: CSIRO publication output and citation impact by year, 2008–12

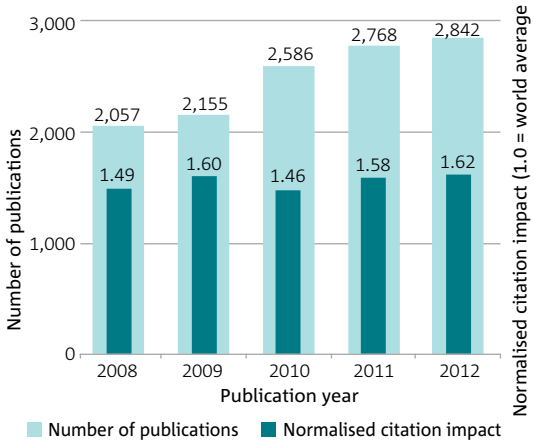
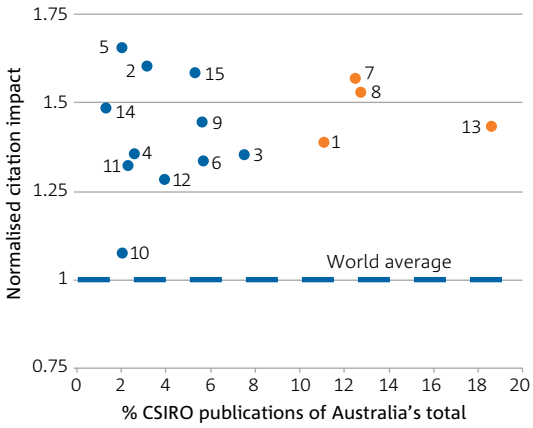


Figure 2.11: CSIRO publication output and citation impact by research field, 2003–12



1	Agricultural Science	9	Materials Science
2	Biology & Biochemistry	10	Microbiology
3	Chemistry	11	Molecular Biology & Genetics
4	Clinical Medicine	12	Physics
5	Computer Science	13	Plant & Animal Science
6	Engineering	14	Social Sciences, General
7	Environment/Ecology	15	Space Science
8	Geosciences		

Top 0.1% field Top 1% field World average

Approximately 55 per cent of all CSIRO's publications are produced in its four strongest fields, ranked globally by total citation count (see Figure 2.11). The remaining fields in which CSIRO ranks in the top one per cent globally are shown in this Figure. The number of fields in which CSIRO is ranked has increased from 14 last year to 15 this year, with the addition of Physics.

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[31] (see Figure 2.12). Overall our citation impact has remained relatively steady over recent years with CSIRO cited articles performing 56 per cent better than the global average for the period 2008–12. Thus, demonstrating that CSIRO is performing competitively and positioned well against its global peers in terms of science excellence.

Another way of using citation counts is to rank them based on percentile performance, compared to all other articles of the same type and in the same subject. CSIRO had 2.6 per cent of its publications in the top one per cent of articles globally, ten per cent of publications in the top five per cent and 17 per cent in the top ten per cent. These results demonstrate that CSIRO's share of the very best research output is substantially ahead of the curve.

31 The count of each article's citations is divided by a baseline calculated from all articles published of the same type, in the same subject, during the same year; the average of these ratios yields a measure of relative citation impact.

UNIVERSITY COLLABORATION

CSIRO partners with universities to complement our science capability and accelerate impact delivery. In 2012 CSIRO undertook various collaborations with 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 2012–13 a number of major projects with Australian universities were commenced. These projects included:

- The launch of the Centre for Food Innovation at the University of Tasmania's Launceston campus (UTas). This partnership with the Defence Science and Technology Organisation and UTas aims to help diversify Tasmania's economic base by growing exports of high-quality, nutritious and value-added food products.
- A $3 million, five-year jointly funded collaboration between CSIRO's Information Communication Technology Centre, New South Wales Department of Primary Industries and the University of New England for the Development and Application of Real-Time Sensors for Enhancing Feed Efficiency and Productivity at Pasture.
- A $13 million collaboration between CSIRO and four leading Australian universities – University of Sydney, University of Newcastle, University of Queensland and University of New South Wales – that will provide specialist knowledge and skills to develop a new suite of tools to understand, develop and optimise energy grids of the future.

CSIRO also continues to work with university, government and industry partners to develop precincts of global scale and standing. In September 2012 Monash University and CSIRO signed a strategic relationship agreement to develop their shared vision for the Australian Manufacturing and Materials Innovation Precinct at Clayton, Victoria. The agreement builds upon the shared strengths of CSIRO and Monash with an agreement to develop a world-class innovation precinct that will underpin the future of Australian manufacturing.

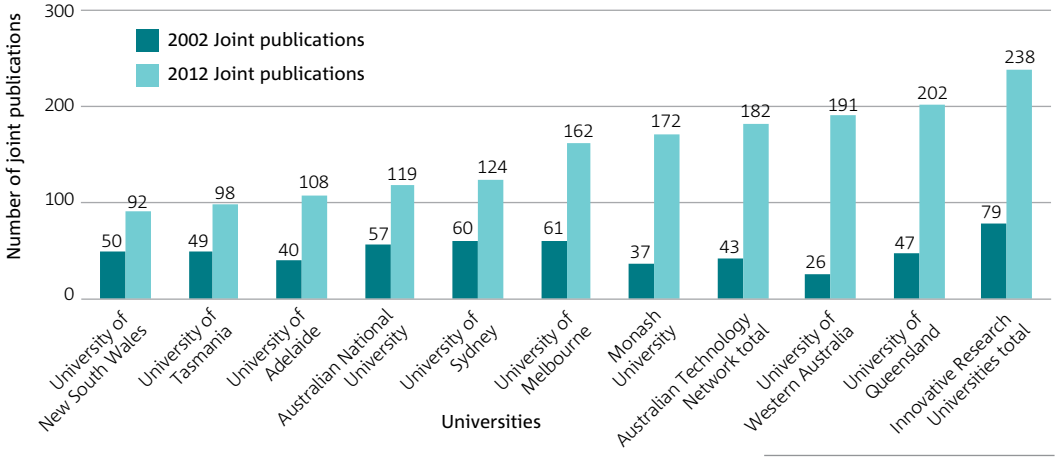
For more information about precincts see ESM 6 on page 10 and KEA 4 on page 5.

JOINT RESEARCH PUBLICATIONS WITH AUSTRALIAN UNIVERSITIES

CSIRO's number of collaborative publications has nearly tripled since 2003. In 2012, CSIRO produced 83 per cent of its publications in collaboration with authors from other institutions. Fifty-six per cent were produced with authors from other Australian institutions.

Figure 2.13 shows that CSIRO's collaboration with Australian universities has increased substantially since 2002 (as measured by joint publications). CSIRO continues 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.

Figure 2.13: CSIRO joint research publications with key Australian universities (2002 vs 2012)[32]



32 Web of Science, Thomson-Reuters

INTERNATIONAL COLLABORATION

This year CSIRO continued to support the Australian Government international development priorities through strong engagement with international peers to access capabilities and deliver impact in new markets that progress Australia's national interests. Without access to the capabilities created by these partnerships with our global peers, we would not be able to achieve the same level of impact with the same cost efficiency.

In 2012–13 we signed a number of agreements with our international peers including collaboration agreements with the Indonesian Agency for Assessment and Application of Technology and the Vietnam Academy of Science and Technology. These agreements have helped to establish a firm strategic footing in Indonesia and Vietnam and more broadly south-east Asia, a region of significant importance to Australia.

In addition to these agreements, CSIRO continued to build relationships with a number of other global peers. In August 2012, Dr Megan Clark led a CSIRO Group Mission to China to strengthen partnerships with our industry and research peers. The Group Mission was supported by the Department of Industry, Innovation, Climate Change, Research and Tertiary Education's Australia-China Science and Research Fund and resulted in commitments to deepen several key relationships. In January 2013, CSIRO and the Huaneng Clean Energy Research Institute were awarded the Excellent International Partner Award by the Beijing Municipal Science and Technology Commission for our work in clean coal.

In India, CSIRO is also creating impact partnerships in a number of areas, with new collaborations underway in concentrated solar power, coal, dimethyl ether gas and medical diagnostics with partners including the Council for Scientific and Industrial Research, The Energy and Resources Institute and Thermax.

In September 2012, CSIRO signed a Memorandum of Understanding with the Chilean Ministry of Mining during Chilean President Piñera's visit to Australia. The two governments are exploring collaboration in water resource management, agriculture, fisheries, energy and environment.

New and reinvigorated partnerships with leading scientific organisations in Europe are supporting CSIRO's global positioning. In particular, CSIRO signed a Letter of Intent with the European Union's Joint Research Centre, and Australia joined the International Institute of Applied Systems Analysis, with CSIRO as the national member organisation.

For more information about CSIRO's collaborations, alliances and partnerships with its global peers see the Operational Plan implementation on pages 4–7.

JOINT RESEARCH PUBLICATIONS WITH OTHER COUNTRIES

Internationally, CSIRO has also significantly increased the rate of collaboration with overseas organisations, as measured by joint publications. In 2012, 48 per cent of CSIRO's scientific publications were co-authored with an international author. Figures 2.14 and 2.15 show the potential impact of our science capability through collaboration with international authors. The top ten countries with which CSIRO co-publishes are, in descending order, the USA, China, England, Germany, Canada, France, New Zealand, the Netherlands, Italy and Japan (Figure 2.14). Joint publications with institutes in China have increased eight-fold between 2002 and 2012. Over the same period joint publications with USA institutions have almost doubled. Figure 2.15 shows the full coverage of CSIRO's collaborations globally.

Figure 2.14: CSIRO joint publications with top ten partner countries (2002 vs 2012)[33]

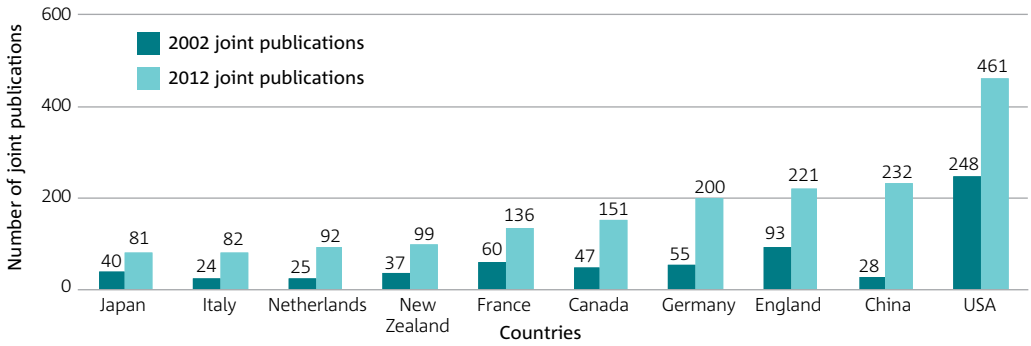
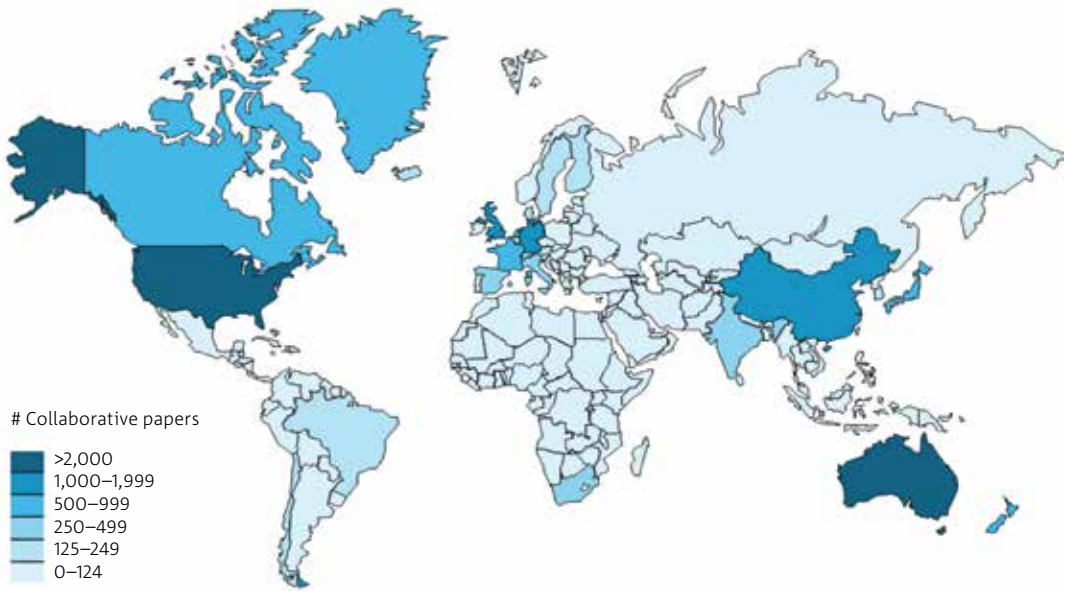


Figure 2.15: Global map of joint publications with CSIRO, 2003–12[34]



33,34 Web of Science, Thomson-Reuters

SCIENCE EXCELLENCE AND CORE RESEARCH ECONOMIC, SOCIAL, ENVIRONMENTAL AND INTANGIBLE BENEFITS

Indicators: Evidence of growing economic, environment, social and intangible benefits through demonstrated adoption of core research outputs and science excellence in CSIRO research capabilities as assessed through a rolling program of rigorous peer review.[35]

A key element in CSIRO's success has been its development and continued maintenance of high-quality scientific capability including world-class researchers, research infrastructure and collaborative relationships. A key mechanism that has assisted to maintain this high standard in research capability has been 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. The panels are encouraged to be forthright in their advice to CSIRO.

In the reporting year one Divisional review was completed. In October 2012, the CSIRO Process Science and Engineering (CPSE) Division, including its nine research themes was reviewed. Overall the panel was impressed with both the quality of the science undertaken by CPSE and the current and potential application base of the science. In particular, it determined that 50 per cent of the research undertaken was recognised as either setting a new scientific direction or sustaining the position of a scientific leader (quality) and 70 per cent were delivering research that enables or sets the standard for commercial, environmental, community or policy development that has real-world application compared with its peers (impact).

These results recognised that CPSE was in a transition phase, where it was shifting focus from traditional minerals to the broader application of process science and systems engineering. As a result, the panel encouraged CPSE to focus its strategic objectives around the context of the future of process science and systems engineering and to work with the Flagships to develop 'over the horizon' industry scenarios in order to plan a set of science capability needs for the next 10 years or more.

INTELLECTUAL PROPERTY MANAGEMENT AND LICENSING

Intellectual Property (IP) is a key tool for CSIRO to capture the benefits of its research for Australia, by protecting the results of our activity and thereby ensuring that our technologies are not inappropriately copied by competitors. CSIRO's Intellectual Property Management framework is provided by the *Statement of Intellectual Property Principles for Australian Government Agencies* and provides guidance and ensures effective identification, protection, ongoing management and exploitation of IP.

Strong portfolios of IP also provide key positioning in various marketplaces, underpinning the focus and strategy of the Organisation and providing external reputation benefits with clients and potential collaborators and competitors.

INTELLECTUAL PROPERTY PORTFOLIO

This year there has been significant activity across the IP portfolio, including a number of patent applications for new inventions currently being processed but are not yet filed. This explains the seeming decline in new applications from 95 last year to 87 this year (see Table 2.6).

The value of CSIRO's IP portfolio is partly revealed by its licensing revenue. In the last financial year approximately a third of the licence agreements were executed with small-to-medium enterprises (SMEs). Over half of the licensing revenue was generated by plant varieties, and the remainder by patent licences, software licences and technology transfer arrangements.

Significant value is gained from the depth and breadth of CSIRO's IP Portfolio. This attracts

35 Source: Portfolio Budget Statements.

TABLE 2.6: CSIRO INTELLECTUAL PROPERTY BY TYPE

IP category[36]	Sub category	2008–09	2009–10	2010–11	2011–12	2012–13
Patents	Current PCT[37] applications	97	90	101	98	83
	Granted	1,625	1,630	1,631	1,649	1,647
	Live cases	3,710	3,379	3,370	3,582	3,454
Inventions	Patent families	743	712	709	728	718
	New	80	99	92	95	87
Trade marks	Australian	265	263	259	275	281
	Foreign	130	114	109	81	88
Plant breeder's rights	Australian	122	122	122	83	87
	Foreign	25	21	21	39	24
Registered designs	Australian	2	2	2	3	3
	Foreign	10	10	10	8	8

collaborators who recognise CSIRO's capability to develop innovative technologies.

It was found that 33 per cent of CSIRO's patent families were the result of collaborative activity with external parties (see Figure 2.16).

Those patent families resulting from such a partnering arrangement were found to involve over 108 distinct partners. The majority of partners can be characterised as industry (55 per cent), with the other partners being universities (17 per cent), government bodies (13 per cent) and research institutes (15 per cent). Almost half of CSIRO's activity with industry relates to collaboration with industry overseas (see Figure 2.17).

CSIRO has collaborated and generated IP with industrial partners such as Bayer CropScience, Boeing Company, PolyActiva and Clinical Genomics, as well as research institutes such as the Mental Health Research Institute and the National Ageing Research Institute.

In 2012–13, CSIRO continued to hold its strong global position with 3,454 live patents cases in over 80 countries (see Figure 2.18).

The total number of live patent cases in Asia has grown by an average of five per cent each year over the last two years. CSIRO has a large proportion of its live patent cases in Asia. A total of 748 live patent cases are in the Asian region,

Figure 2.16: Collaboration resulting in patents, 2012–13

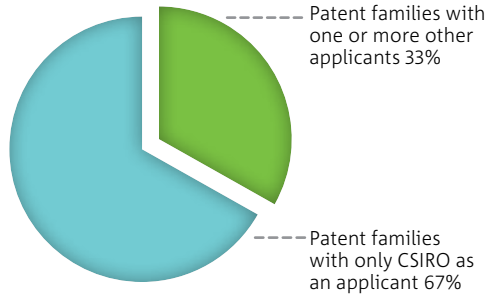
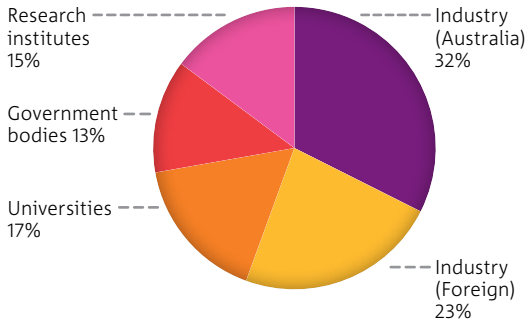


Figure 2.17: Distribution of distinct partners, 2012–13



36 IP categories are defined in the glossary on page 193.

37 Patent Cooperation Treaty.

with cases in countries such as Japan, China, India, South Korea, Hong Kong, Malaysia, Indonesia, Singapore, Vietnam, Taiwan, Thailand and the Philippines. These countries combined represent approximately 22 per cent of the live patent cases in CSIRO's patent portfolio (see Figure 2.19).

There has also been an increase in the number of filings in the South American and African regions. These regions have had an average annual growth rate of nine per cent and five per cent respectively over the last two years. However, these areas only represent a relatively small portion of CSIRO's patent portfolio, with live patent cases in South America and Africa together making up less than seven per cent of the portfolio.

Figure 2.18: CSIRO's live patent cases by geographic region, 2011–13

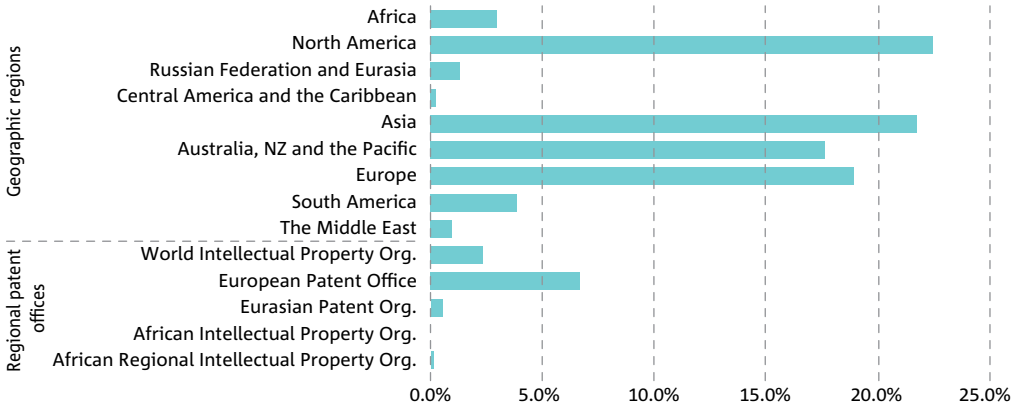
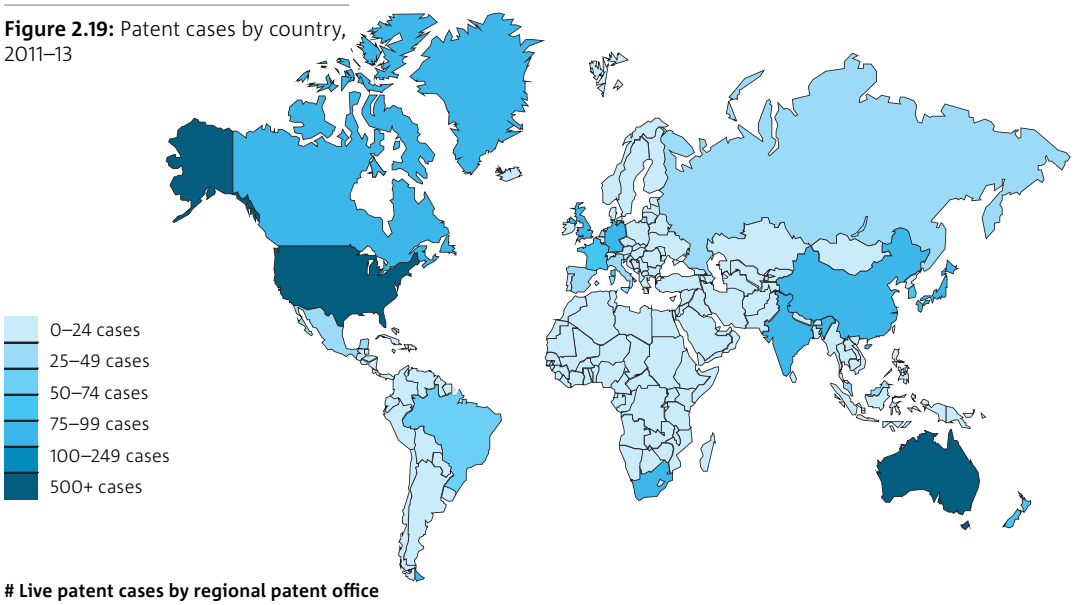


Figure 2.19: Patent cases by country, 2011–13



 # Live patent cases by regional patent office

4 cases	African Regional Intellectual Property Organisation
2 cases	African Intellectual Property Organisation
18 cases	Eurasian Patent Organisation
229 cases	European Patent Office
83 cases	World Intellectual Property Organisation

Note: Regional patent office figures not shown on map.

AUSTRALIAN GROWTH PARTNERSHIPS PROGRAM

To support the growth of the IP Portfolio, CSIRO places significant focus on strategic engagements and collaboration with industry partners. In 2007, CSIRO 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 CSIRO's National Research Flagships Program.

As at 30 June 2013, six SMEs were engaged in the AGP program. This year $1.2 million was invested in two SME companies, including follow-on investments. In addition to this, there was one completion and exit from the program providing a positive return to CSIRO, and another company was added to the program.

DIRECT NICKEL-CSIRO PARTNERSHIP TO DELIVER HUGE BENEFITS TO THE GLOBAL NICKEL INDUSTRY

CSIRO continues to engage with industry to develop collaborations that progress its various technologies into the global marketplace. One success story that demonstrates this is CSIRO's engagement with Direct Nickel (DNi). Approximately five years ago CSIRO started to provide DNi with technical assistance in exploiting patented nitric acid recycle technology for hydrometallurgical processes. CSIRO has made a financial contribution to the project and received in return equity in the company. This partnership, resulted in a hydrometallurgy process that could potentially unlock 70 per cent of the world's nickel supply found in laterites and secure DNi's global competitive advantage. Building on this development, DNi began full-scale testing of the process at a $5 million pilot plant at CSIRO's Australian Minerals Research Centre in Perth. The plant was officially opened by the Western Australian Minister for Mines and Petroleum, the Hon Bill Marmion, on 24 May 2013.

EQUITY PORTFOLIO

The total value of CSIRO's equity portfolio at 30 June 2013 was $10.5 million across listed and unlisted companies. CSIRO's overall total equity portfolio decreased slightly from 30 June 2012. Major contributing factors were the decrease in value of listed companies due to ongoing unfavourable market conditions and the declining shareholding value of a number of unlisted portfolio companies. There have been no new spin-out companies formed during 2012–13. However, as Table 2.7 indicates, seven of the portfolio companies have raised over $24 million from capital markets during the year to help fund ongoing commercialisation activities.

CSIRO licences technology to existing companies where that is deemed the most likely route of maximising the value of the IP. However, it also directly creates new high technology SMEs through spinning out IP when that is deemed to be the best available pathway to commercialisation. CSIRO currently has interests in 34 companies.

TABLE 2.7: PORTFOLIO MOVEMENTS AND ACTIVITY DURING 2012–13

Activity	No of companies	Value ($m)
Companies created	0	0
New capital raised[38]	7	24,262
New CSIRO equity contributions	2	1.2
Wound-up	1	0

38 Capital raised from all sources by companies within the portfolio.

ENERGY[39]

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Powering the future is arguably the greatest environmental, economic and social challenge we have to resolve in the early decades of the 21st century. Australia has a number of choices for its energy future; no single solution will solve the energy puzzle. In shaping this future, Australia will need to take into account uncertainties associated with multiple, interacting variables including increased demand, environmental sustainability, greenhouse gas policy compliance, economic viability, energy security, water availability, land use choices and social acceptability. Australia's vast ocean domain also presents challenges and opportunities for wise use, conservation and management.

As part of our efforts to help solve the energy puzzle, the Group is delivering science and technology to inform and support development of Australia's substantial gas resources, both onshore and offshore.

OUR RESPONSE

CSIRO is tackling these challenges with an integrated energy research portfolio that aims to reduce greenhouse gas emissions, ensure energy supply and maximise the country's social, economic and environmental wealth from our rich endowment of energy resources and ocean territory. Our focus is to develop options to accelerate large-scale emissions cuts while ensuring a smooth transition to a new energy future. We are working with industry, governments, the community and our research partners to maximise the number of prospective energy options for Australia, and to enable informed decisions about Australia's coasts and oceans.

On 27 September 2012, Senator the Hon Chris Evans (the then Science Minister) officially launched the government-funded National Geosequestration Laboratory in Perth. This collaborative facility incorporates CSIRO, The University of Western Australia and Curtin University, and will help provide government and industry certainty regarding the viability and safety of commercial-scale storage of carbon dioxide.

CSIRO's Geothermal Project is proving the viability of using groundwater and solar power to cool the Pawsey Centre Supercomputer with zero emissions.

On 1 July 2013 CSIRO merged its Energy Transformed Flagship and Advanced Coal Technology and Petroleum and Geothermal Research portfolios to create the new Energy Flagship, an integrated $120 million vehicle to help Australia create a prosperous and sustainable energy future across the entire energy value chain.

OUR PATHWAY TO IMPACT

During the financial year, the $4.5 million Shale Research Centre (SHARC) Consortium was completed and has delivered valuable data and models of shale behaviour to its six industry sponsors. This will help reduce billions of dollars of annual losses associated with these rocks. Two new consortia – one a continuation of shale property studies and the other focusing on gas shales – are being launched in response to the success of SHARC.

A $10 million joint project with China United Coalbed Methane Corporation Limited (CUCBM) has successfully demonstrated that storing carbon dioxide underground increases the extraction of methane that can be used as an energy source. The project was undertaken in the Shanxi Province, China. CSIRO's work with CUCBM addresses the critical issues of low-emission energy supply, climate change and emissions reduction on a global scale. The project allowed CSIRO to increase its capabilities in pilot-scale demonstrations for carbon capture and storage technologies and has advanced the development of a low-emissions coal technology that could be deployed in Australia.

39 See organisational chart, pages xii–xiii, for the structure of each Research Group.

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.

Improving safety and productivity in longwall mining operations

CSIRO has secured the first international sale of its innovative longwall automation technology, which increases coal mine productivity and improves safety. The technology will be operational in 2014 at an underground coal mine in the United States.

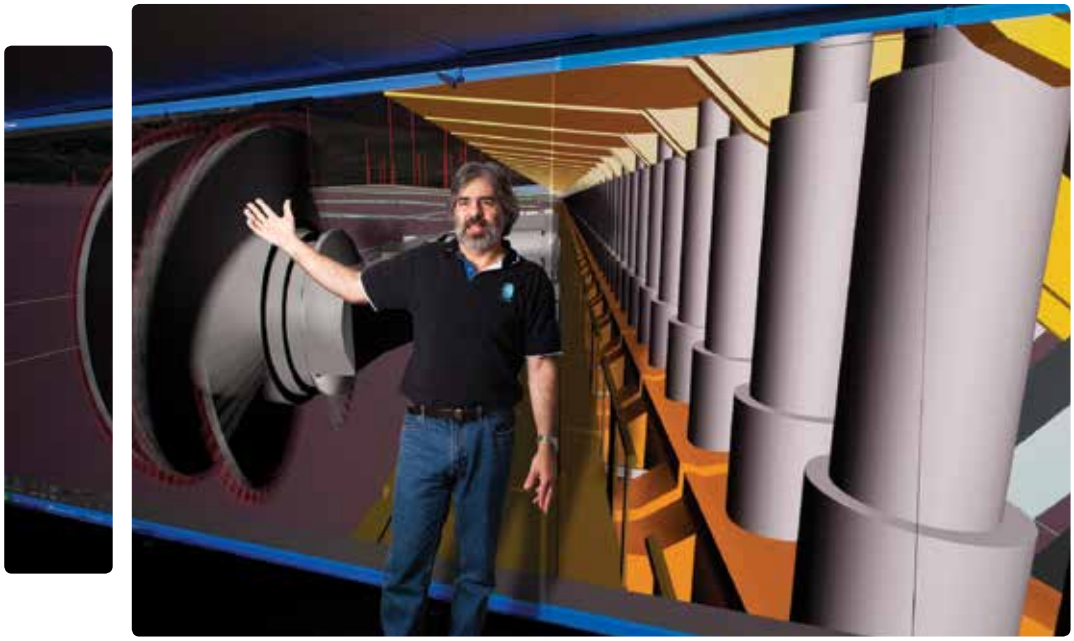
Longwall mining accounts for about 90 per cent of Australia's underground coal production. In the longwall process a shearer, a machine with large rotating cutting drums, is driven back and forth across the coal seam. With each pass a massive 'slice' of coal is extracted. Keeping the system aligned with the seam is crucial, not just for efficiency, but more importantly for safety. Previously, longwall guidance systems had to stop mining to correct the shearer position and required miners to work near the machine. This interrupted production and placed personnel in the direct vicinity of hazardous, noisy equipment and a dusty environment.

CSIRO's world-leading longwall automation technology uses specialised remote guidance to continuously steer the longwall shearer by plotting its position in three dimensions. This removes personnel directly from hazards, resulting in increased safety and productivity. The real-time progress of the longwall can be monitored across the Internet to anywhere in the world, leading to further gains in efficiency.

This innovation has emerged as an essential component of modern automated longwall mining operations with more than half of Australia's longwall underground operations already using it. It realises the coal industry vision of improved safety, productivity and reliability at the lowest cost per tonne, and is delivering an economic benefit of up to ten per cent a year.

CSIRO has licensed its longwall automation technology to five major global longwall equipment suppliers and these companies are now offering it to the Australian and United States coal mining sectors.

CSIRO's technology is the commercial outcome of a Landmark longwall automation project funded by the Australian Coal Association Research Program.



Con Caris demonstrates software to remotely visualise and monitor the longwall automation three dimensional guidance technology, that forms part of the underground longwall mining control system.

ENVIRONMENT[40]

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Australians have stewardship of a beautiful, diverse and unique environment. The cumulative consequences of the last 200 years of development of natural resources in Australia leave us with a legacy of economic opportunity as well as environmental challenges. The future of Australia, the Asia-Pacific region, and indeed the whole world, is also being re-shaped by the forces of climate variability and change, natural resource quality and security, technological revolution, trade reform, poverty alleviation and national security concerns. The Environment Group seeks to position CSIRO as the research and development organisation of choice for trusted advice for Australian governments, industry, and society, and in doing so help meet these challenges and ensure the ongoing prosperity of the Nation.

OUR RESPONSE

CSIRO's response to these challenges and opportunities involves the application of enhanced systems understanding, as well as the development and deployment of new technologies, processes and services. The CSIRO Environment Group is doing this by boosting our understanding of the operation and interaction of entire ecosystems, regional economies, and societies.

OUR PATHWAY TO IMPACT

The reporting year saw significant achievements such as our continued development of the Australian Community Climate and Earth System Simulator (ACCESS) system that is improving weather and climate forecasts (more on page 57).

Australia's first large-scale rainforest research plot was opened in the World Heritage Wet Tropics region in partnership with the Terrestrial Ecosystem Research Network. This will enable long-term monitoring of key Australian ecosystems and provide answers about species distribution, potential carbon storage and exchange, and the impacts of climate change.

The Group is also working with GhostNets Australia and Indigenous rangers to identify hotspots where lost fishing nets are threatening our marine biodiversity.

Internationally, CSIRO and the National Oceanic and Atmospheric Administration are implementing a Memorandum of Understanding to improve global weather, ocean and climate forecasting. Collaborations deepened through the Intergovernmental Platform on Biodiversity and Ecosystem Services and CSIRO joined the International Institute for Applied Systems Analysis and the Belmont Forum on Global Change. Partnerships in Asia also grew.

Industry collaboration remains strong. The Gas Industry Social and Environmental Research Alliance, through which CSIRO delivers 100 per cent publicly available independent research, is delivering 16 research projects across the social, economic and environmental dimension of the coal seam gas industry to inform resource development.

CSIRO and its partners are developing a molecular technique to survey insect biodiversity – 'ecogenomics' – potentially revolutionising new species discovery and conservation management. CSIRO and the Australian National University also launched the Centre for Biodiversity Analysis which will harness new and emerging technologies to improve our knowledge of Australia's biodiversity and inform managers.

CSIRO and Ziltek Pty Ltd commercialised a new hand-held device for the rapid and highly cost-effective in-field analysis of petroleum contamination in soil. An average mid-size remediation firm in Australia spends around $250,000 on soil petroleum analysis each year, and RemScan™ can reduce this cost by 50 per cent.

40 See organisational chart, pages xii–xiii, for the structure of each Research Group.

RESEARCH GROUP AIM: A sustainable Australia addressing global challenges, in which CSIRO's environmental research and development role is pivotal and acclaimed.

New models to improve weather and seasonal climate forecasts

Australia is not just a land of droughts and flooding rains, but of bushfires, tropical cyclones, severe thunderstorms and treacherous seas. Such high-impact weather within a highly variable climate imposes significant social and financial costs on the community.

To address these challenges, the Bureau of Meteorology and CSIRO formed a significant partnership – the Centre for Australian Weather and Climate Research (CAWCR). The Centre pursues earth system science, a multidisciplinary approach to deliver timely, policy-relevant science and knowledge to meet immediate and long-term environmental, social and economic challenges of the nation.

A core component of CAWCR's earth system science is ACCESS. ACCESS models not only weather and climate but hydrological and terrestrial processes, atmospheric chemistry, and the complex interactions between the physical components of the earth system.

Over the last five years, the development of ACCESS has led to a world-class weather and climate prediction system for Australia. ACCESS was used to great effect during the major Victorian flood events between September 2010 and February 2011 which affected one-third of the state and cost the community in excess of $1.3 billion.

ACCESS enabled a more accurate prediction of the extreme rainfall that led to flooding in western New South Wales in early March 2012. The ACCESS model gave many days of advance warning of a band of heavy rain across Australia with predicted and observed five-day accumulations over 200 millimetres in many places.

ACCESS simulations of climate and climate change have been used in more than 60 published climate studies in the past year. The ACCESS model delivers a ten-fold improvement in our nation's every day weather forecasts.

New ACCESS-based models are meeting more specific needs of various sectors, such as emergency management in fire situations. Black Saturday alone cost 173 lives and almost $4.3 billion. To enable firefighters access to more detailed weather information, a high-resolution version of ACCESS has been developed.

ACCESS was developed in collaboration with the UK Meteorological Office, by CSIRO and the Bureau of Meteorology as part of the CAWCR, with input from Australian universities.

ACCESS provided high-resolution forecasts five days ahead of the 2011 Victorian floods.
Image: North Central Catchment Management Authority

FOOD, HEALTH AND LIFE SCIENCE INDUSTRIES[41]

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Global food security remains a fundamental challenge as the world 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

During 2012–13, our researchers worked with international colleagues to identify a set of genetic fingerprints to help Australian farmers understand the pedigree of their sheep stock, which could result in high-quality food and fibre products from sheep.

In April 2013, the Centre for Food Innovation was opened in Tasmania. This Centre was realised through strong partnerships with the University of Tasmania and the Defence Science and Technology Organisation, and will add value to Tasmanian produce and provide better food to Australian soldiers, through improvements in food processing.

This financial year, the group collaborated with international researchers to contribute to the global understanding of agriculturally important crops, sequencing the cotton and chickpea genomes. Better understanding of the cotton genome will help breeders to develop new cotton varieties that have increased disease resistance, or adaptation to environmental conditions, supporting the industry. Chickpea is the second most widely grown legume globally, and plays a crucial role in food security in developing countries. Sequencing the chickpea genome will help researchers and breeders to develop chickpea varieties with greater yield or disease resistance to support food supply in these countries.

CSIRO's contribution to Australia's biosecurity system has been enhanced in 2013 through the launch of our new National Research Flagship for Biosecurity, which will support Australia's social, environmental and economic wellbeing by reducing the risk of pest and diseases and improve the effectiveness of mitigation and eradication responses (more on page 22).

OUR PATHWAY TO IMPACT

The reporting year saw significant milestones in the uptake of our innovation in the food and agricultural industries. Selective breeding programs for Australian stocks of Atlantic salmon, Pacific oysters, abalone, black tiger prawns have all achieved greater than ten per cent gains in growth per generation, increasing the productivity for our industry partners (more on page 31).

Our innovations to support agricultural management are helping farmers, with 84 countries around the world now using our Agricultural Production Systems Simulator (APSIM) tool. 2013 also saw the launch of CSIRO's first iPad application, SoilMapp (more on page 39), providing information relevant to agricultural productivity and land management decisions.

On 1 November 2012, the fight against the deadly Hendra virus received a boost with the introduction of Equivac® HeV vaccine, a result of our collaboration with industry and international organisations. Our Australian Animal Health Laboratory (AAHL) facility played a critical role in developing this vaccine as AAHL is the only laboratory in the world equipped for this type of high-containment, large-animal research (more on page 23).

In 2013 we celebrated 40 years of CSIRO cotton research, supporting an industry that has grown to be one of Australia's biggest agricultural industries, valued at up to $2 billion a year (more on page 59).

41 See organisational chart, pages xii–xiii, for the structure of each Research Group.

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.

Transforming the cotton industry for competitive results

The cotton industry is one of Australia's most significant agricultural industries. As one of the top four cotton exporters globally, Australia competes in a heavily subsidised international market. To survive and thrive Australian cotton farmers need higher yields and lower production costs. Cotton crops are regularly threatened by weather extremes and disease and can be devastated by insect pests.

CSIRO cotton breeders introduced insect resistant cotton into varieties bred especially for Australian conditions. Widespread adoption reduced the insecticide sprayed on Australian cotton by 85 per cent, compared with conventional varieties, improving environmental sustainability and profitability. Since then, new genetic traits have cut residual herbicide usage by 52 per cent, improving soil health and reducing waterway contamination.

CSIRO cotton scientists applied their expertise to plant breeding, biotechnology, farming systems, assessment for disease resistance, and postharvest processing to optimise yield and quality. CSIRO worked closely and co-invested with the cotton industry and its peak industry bodies to achieve this outcome. To market CSIRO cotton varieties in Australia and internationally, CSIRO works in a joint venture called Cotton Breeding Australia.

Agreements between CSIRO and key global companies with interests in agricultural biotechnology ensure access by Australian farmers to the valuable new traits which are delivered through CSIRO cotton varieties. It is highly likely that the Australian cotton industry, as we know it today, would not have existed without this combination of investment, expertise and engagement. CSIRO's major impact for Australia's cotton industry was possible because of its specialised breeding skills coupled with widespread deployment of new cotton varieties by its partners.

Cotton production has grown into one of Australia's biggest agricultural industries; an average season is valued at more than $1.3 billion a year. Economic assessments of CSIRO's cotton breeding program show an estimated 80:1 return on investment and more than $5 billion net present value from increased yield and regional adaptation in Australia.

Today, more than 95 per cent of Australian cotton, as well as half the dryland cotton grown in the US and about one-third of the cotton in Brazil, Turkey and Greece can be linked to CSIRO-bred varieties. These varieties also have far reaching environmental benefits with increased water efficiency, while delivering a higher yield per litre of water input.

CSIRO cotton breeder, Warwick Stiller, examines a cotton flower in a glasshouse trial of new varieties at CSIRO's Myall Vale cotton research facility near Narrabri, New South Wales. Image: Melanie Jenson

INFORMATION SCIENCES GROUP[42]

ANALYSIS OF PERFORMANCE

THE CHALLENGES

One of the biggest challenges facing modern science is the ability to collect, communicate and interpret the massive amounts of data generated in all areas of research ranging from astronomy and astrophysics to materials, environmental, energy, information and life sciences.

It is predicted that by 2020 there will be 37 billion 'things', from our car to our fridge door, connected to the Internet[43] and the average person will own six different smart devices[44]. This increasing connectivity is creating an explosion in the volume, velocity and variety of data and information available at our fingertips. The Information Sciences Group is focusing on two key challenges: developing better ways to capture, manage and analyse these growing streams of 'big data' so scientists can turn complex systems and information overload into knowledge, and growing CSIRO research productivity through an increasing range of e-Research initiatives.

OUR RESPONSE

To address these challenges, the Group has formed close ties with industry, government, the community and world-class research partners at home and abroad to develop world-leading computational and simulation science capability platforms. We are developing and delivering strategic scientific capability and discovery in mathematics, statistics, robotics, autonomous systems, advanced telecommunications, wireless, antennae and sensor network research. In addition, the Group is enabling 'big science' across all CSIRO research disciplines through the e-Research program involving ongoing capability growth in supercomputing, research data management and advanced collaboration, simulation and visualisation.

To keep CSIRO globally competitive and responsive in key research areas of information sciences a new Division, Computational Informatics, was formed during the course of the year and officially launched on 1 July 2013. The new Division will work on a range of national challenges such as declining productivity and emerging health issues in our ageing population.

Internationally, the Group is developing research alliances with partners such as General Electric, Boeing, Lockheed Martin, Orica and AusAID. Our international business connections and collaborations with China and the US are increasing, and we work with the United Nations on spatial information access.

Our biggest international alliance involves developing and delivering world-leading technologies and research in astronomy, astrophysics and space tracking via the Australia Square Kilometre Array Pathfinder and international Square Kilometre Array (SKA) projects (more on page 61). The SKA is Australia's biggest strategic international science opportunity. While driving Australia's engagement in this project, CSIRO is also helping develop Perth as a global centre for radio astronomy and building our relationship with NASA in the US, CSIRO's largest commercial partner.

OUR PATHWAY TO IMPACT

During 2012–13, the Group focused on critical issues relating to healthcare delivery. Working with the Australian Centre for Broadband Innovation, CSIRO is reducing healthcare costs by helping older Australians live in their own homes longer, more safely and independently, using next-generation broadband networks to gather health and medical information remotely from the patient at home.

Other industries are also reaping the benefit from this explosion of data. For example, the Group and its partners developed innovative modelling programs to minimise transport costs and increase productivity and efficiency for the Hunter Valley Coal Chain Coordinator. This organisation is the largest and most complex coal export operation in the world, exporting more than 90 million tonnes per annum and generating around $15 billion in annual export revenue. Our ongoing strategic partnership has helped increase Hunter coal exports and improved operating efficiency.

The Group also produced Zebedee – the world's first mobile hand-held laser mapping system, in collaboration with global partners. Zebedee is a fast and accurate 3D mapping device that overcomes the cost, slow speed and technical constraints of existing systems. Zebedee enables a user to generate a 3D laser map simply by walking through a desired location and can be used for applications ranging from street mapping and mining surveys to searching disaster sites and recording details of a crime scene. Zebedee will soon be available on the international market.

42 See organisational chart, pages xii–xiii, for the structure of each Research Group.

43 Cisco Internet of Everything report: www.cisco.com/web/about/ac79/docs/innov/IoE.pdf

44 Cisco Internet of Things report: www.cisco.com/web/about/ac79/docs/innov/IoT_IBSG_0411FINAL.pdf

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.

New technology transforms our understanding of the Universe

CSIRO's newest radio telescope, the Australian Square Kilometre Array Pathfinder (ASKAP), will be one of the most powerful survey radio astronomy instruments on the planet. Currently in its commissioning phase, the ASKAP's combination of increased survey speed and sensitivity will enable breakthroughs in the way we understand the Universe.

New receiver technology, based on digital processing solutions and phased array theory, developed especially for ASKAP, will capture radio images with unprecedented sensitivity over large areas of sky. This technology will offer a 20-fold increase in survey speed and increase the field-of-view by a factor of 30 compared with any other radio telescope in the world today.

Recent testing captured the world's first ever multi-beam image produced with the new receiver technology on separate ASKAP antennas, an important milestone in commissioning the full ASKAP telescope.

In addition to being a world-leading telescope in its own right, ASKAP is also an important facility for testing new technologies, and will itself be incorporated into phase one of the future international SKA project.

The SKA is a global science and engineering project, involving more than ten countries, to build the world's largest radio telescope. It will provide insight into the formation and evolution of the first stars and galaxies after the Big Bang, the role of cosmic magnetism, the nature of gravity and possibly even life beyond Earth.

Antennas of CSIRO's Australian Square Kilometre Array Pathfinder at the Murchison Radio-astronomy Observatory in Western Australia. Once fully operational, 36 identical dish antennas will make up one the most powerful survey radio astronomy instruments in existence. Image: Alex Cherney, terrastro.com

MANUFACTURING, MATERIALS AND MINERALS GROUP[45]

ANALYSIS OF PERFORMANCE

THE CHALLENGES

Australia's manufacturing and minerals sectors are operating in an increasingly challenging environment. Innovation is one solution to this problem and the Manufacturing, Materials and Minerals (MMM) Group works in partnership with local and multinational organisations to deliver innovative technologies, products and processes which help to improve competitiveness and enhance sustainability.

OUR RESPONSE

In 2012–13, the Group continued to foster and strengthen relationships with industry, research providers and governments. CSIRO provided expert advice to policy makers and industry groups through forums such as the Prime Minister's Taskforce on Manufacturing.

The Group continued to work on some of Australia's toughest challenges with major companies such as Boeing, General Electric and Orica. 2013 will mark the twenty-fifth year of our relationship with Boeing. This year CSIRO also engaged with more than 1,200 Australian small-to-medium enterprises, with many of these interactions led by the MMM Group.

In partnership with Monash University, the Group launched the Australian Manufacturing and Materials Precinct (AMMP) in south-east Melbourne, as a hub for industry and research-based organisations. At the heart of CSIRO's vision for AMMP is the creation of the Factories of the Future Innovation Centre.

The Group has also pledged support for the establishment of an industry-led innovation precinct – the Manufacturing Excellence Taskforce Australia.

In mineral exploration, the Minerals Down Under Flagship is playing a leading role in UNCOVER, a national collaborative research drive, to develop tools to successfully explore through the thick layer of sediment that covers the majority of the Australian continent. The Flagship is also active in the Deep Exploration Technologies Cooperative Research Centre.

OUR PATHWAY TO IMPACT

In mineral resources, the Group has helped redefine large open pit mine design, ensuring mine slopes are reliable, minimising loss of life, equipment damage and sustained production losses in the event of mine slope failure (more on page 35).

In February 2013 the open access Virtual Geophysics Laboratory was launched, allowing scientists from across Australia to access geophysics data online. Research that used to take one week now takes just 15 minutes with this new tool. This was a multi-partner collaboration with Geoscience Australia, the National Computational Infrastructure, and several universities.

In manufacturing, CSIRO signed a major technology deal with Australian healthcare company Medical Developments International, for the next generation production of the paramedic's 'Green Whistle', an inhaler used to relieve pain. This will assist the company's global growth and ultimately give more patients access to this innovative treatment.

The Group also helped develop a new ultra-absorbent material, in partnership with Victorian manufacturer Textor Technologies and Kimberly-Clark, which is now sold in Huggies Newborn Infant nappies (more on page 33).

The Group continues to partner with universities and industry to deliver positive impact. Major co-locations include the 'New Horizons' building with Monash University at Clayton, Victoria. Research will focus on material engineering including computational and physical modelling of manufactured products and services in the biomedical, aerospace and renewable energy fields. In collaboration with Deakin University, CSIRO and the Victorian Centre for Advanced Materials Manufacturing, the Australian Future Fibre Research and Innovation Centre was opened in Geelong, Victoria in February 2013. The Centre will focus on all aspects of fibre manufacturing, including carbon fibre development.

45 See organisational chart, pages xii–xiii, for the structure of each Research Group.

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.

Manufacturing to support the global fight against disease

Rotavirus, the most common cause of severe diarrhoea among infants and young children, is a serious problem for communities around the globe. But access to appropriate treatment is limited or unavailable in many developing countries, which is where 95 per cent of all rotavirus deaths occur.

Commercial vaccines exist, but they are not widely available or affordable in many parts of the world. With 800,000 children under five dying and millions more hospitalised from severe, dehydrating diarrhoea each year, a new accessible and affordable vaccine is vital.

The Program for Appropriate Technology in Health (PATH) is an international, not-for-profit organisation that has been working with a number of international partners to develop new accessible and affordable vaccines for the deadly disease.

Antibodies are required in large amounts for use as quality control reagents by vaccine manufacturers. PATH collaborated with CSIRO to provide the capabilities and infrastructure to perform the large-scale production of different monoclonal antibodies and supply these quality reagents to control the quality of new vaccine candidates.

In December 2012, CSIRO's state-of-the-art protein production facility in Clayton, Victoria produced 6,000 vials of monoclonal antibodies. These were distributed to India, where they are being used to control the quality of new vaccine candidates under development for rotavirus.

This new vaccine will mean cheaper and more accessible prevention methods for children in India, China, Brazil and other parts of the world, potentially saving thousands of lives.

Dr George Lovrecz led the project to produce the antibodies.

PROGRAM 3
Science Outreach: Education and Scientific Publishing

SCIENCE OUTREACH – OBJECTIVES AND DELIVERABLES

CSIRO's science outreach programs aim to promote the importance of science and its application to students, parents, teachers and the Australian community, which helps Australia to remain innovative and competitive in science.

CSIRO is in a strong position to help create a knowledgeable society by raising scientific literacy and communicating the outcomes, impacts and benefits of scientific research so the community can engage with major issues related to science. CSIRO engages with the community through a variety of multimedia channels. Communicating scientific research helps raise the profile of science and CSIRO within the community. CSIRO supports undergraduates, postgraduates and postdoctoral researchers to boost the calibre of researchers working in the Australian community, which is important for Australia's future innovation capacity.

CSIRO also operates **CSIRO** PUBLISHING as an independent science and technology publisher with 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.

SCIENCE OUTREACH – PROGRAM PERFORMANCE

The performance of CSIRO's Science Outreach Programs is assessed through six performance indicators. Table 2.8 provides a summary of progress. More detailed analysis and trend data follows the Table.

TABLE 2.8: PERFORMANCE INDICATORS FOR PROGRAM 3 – SCIENCE OUTREACH

Key performance indicator	Target (and performance assessment)	Performance
Utilisation of science outreach programs	Increasing	Utilisation of our science outreach programs has been maintained with some increases and decreases. Membership and subscription to our Double Helix Science Club and Maths by Email have increased by 13 per cent. Visitor centres experienced a slight decrease due to staff shortages and higher figures the previous year due to successful open days.
Awareness of science by CSIRO stakeholders	Positive perceptions and awareness	Awareness of CSIRO is still high among the community, with nearly 80 per cent of surveyed community members rating CSIRO as trustworthy, including 56 per cent of the public rating it as extremely trustworthy.
Success of participants in the Science Outreach Programs	Qualitative evidence of success	Surveys indicate that our science outreach programs are having a positive impact on target audiences. Over 95 per cent of the 6,000 plus teachers surveyed relating to the CSIRO hands-on science programs believed the programs were likely to have a lasting impact.
International reach and impact of published journals	Improving trend in impact factors (IF)	Of 26 journals, four are not ranked with IFs. Twenty-two journals improved their IF on the previous year. Twelve journals achieved their best-ever IF. Average IF across all journals was 1.6, its highest-ever score.
New book titles	Increase or maintain number of titles	This year the publishing rate for new book titles was maintained by publishing 42 new book titles in print and digital formats.
Net Profit from **CSIRO** PUBLISHING	$651,226	**CSIRO** PUBLISHING exceeded its planned profit and delivered a net profit of $770,848 (18.3 per cent more than anticipated).

Green shading: indicates positive progress for the year and the target has been achieved. **Yellow shading:** indicates some challenges have occurred during the year, but they were managed. **Red shading:** indicates challenges have affected progress and resulted in the target not being achieved. **White/no colour:** indicates that this is the first year results have been recorded for this indicator therefore no trend can be observed.

UTILISATION OF SCIENCE OUTREACH PROGRAMS

Education programs

CSIRO conducts a range of science education programs for school students, their teachers and the public. These programs offer a range of science education projects designed to inform students, their families and teachers of the contribution scientific research makes to the community.

CSIRO Education continues to offer a range of valued programs to teachers and students. The Science Education Centres hosted 363,099 students and teachers in 2012, see Table 2.9. This was a decrease of 11,698 students and was primarily attributed to a staff shortage in the Brisbane centre which has now been resolved. A recent appointment of a new manager and a full staff complement in the Brisbane centre is expected to reverse this anomaly in the results next year. The opening of a new CSIRO Education Centre in Hobart this year is also expected to yield positive results next year in terms of the total number of students and teachers utilising the Science Education Centres.

At the end of 2012 there were 1,537 Scientists and Mathematicians in Schools partnerships in 1,152 schools. CarbonKids continued to expand its reach with 253 schools registered by the end of 2012.

The Discovery Centre and major visitor centres

CSIRO also hosts the CSIRO Discovery Centre in Canberra and operates major visitor centres at the Parkes Observatory in New South Wales and the Canberra Deep Space Communication Complex (CDSCC). These centres are purpose-built to showcase CSIRO research in an entertaining way that demystifies and educates people of all ages about research and innovation.

CSIRO Discovery Centre's education programs for schools continued to grow. The Centre focused on new education and outreach activities on weekends when more of the community could participate. Consequently, our science-themed birthday parties were booked out for many weekends and a new Easter family science weekend brought in 6,000 paying patrons. CSIRO Discovery hosted three artists in residence which resulted in the symposium SPECTRA.

TABLE 2.9: SCIENCE OUTREACH: EDUCATION PROGRAMS

Program	2008	2009	2010	2011	2012
CSIRO Science Education Centres (visitors)	390,947	386,500	389,287	374,797	363,099
Double Helix Science Club (members)	20,253	19,656	15,821	13,851	15,958
Science by Email (subscribers)	29,560	34,933	38,156	41,204	42,422
Maths by Email* (subscribers)			9,255	14,967	17,292
Creativity in Science and Technology (CREST) (participants)	8,355	8,801	9,668	8,385	7,767
BHP Billiton Science Awards (participants)	2,568	3,114	3,658	3,770	4,065

*Launched in 2010

TABLE 2.10: SCIENCE OUTREACH: VISITOR CENTRES

Discovery Centre and visitor centres	2008	2009	2010	2011	2012
CSIRO Discovery Centre (visitors)	80,555	94,365	100,920	108,060	113,000
Parkes radio telescope (visitors)	92,369	112,342	95,104	96,609	92,876
Canberra Deep Space Communication Complex (visitors)	67,538	67,582	70,044	77,350	68,710

The symposium explored the cultural and artistic value of scientific imagery and drew speakers from Oxford University and the University of Chicago. The Centre led CSIRO's contribution to the Centenary of Canberra celebrations by developing an iPad application exploring CSIRO's history in the region, and our science film festival SCINEMA was included on the cultural program of Australia's Embassies and High Commissions by the Department of Foreign Affairs and Trade.

Visitor numbers to the Parkes radio telescope were 92,876 in 2012 (see Table 2.10 on page 65). This decrease on the previous year was due to the Parkes Observatory celebrating its 50th year in 2011, which boosted visitor numbers. Education and outreach programs included 25 school holiday workshops, a teacher's astronomy weekend workshop, 12 solar telescope viewing sessions, and monthly amateur astronomy meetings. Seven high school work experience students and a CSIRO summer vacation student were also hosted at the centre, undertaking a range of tasks, which included working on astronomy-related resources and exhibits, as well as supporting workshop activities.

The CDSCC provided education programs to 12,430 students and educators during 2012. Approximately 8,200 were students from Kindergarten to Year 6, 2,200 in years 7–12, 1,000 undertaking tertiary studies and 1,000 were educators. School education programs cover the broad spectrum of science, technology, engineering and mathematics subjects, with a focus towards their uses in space exploration and astronomy. Real world examples of CSIRO's space exploration activities demonstrate the impact of science in students' lives. Visitor numbers were slightly lower than the previous year due to a highly successful CDSCC Open Day in 2011.

The visitor centre at the Canberra Deep Space Communication Complex.

Postgraduates and postdoctoral researchers

CSIRO's 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 2.11. 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.

Some CSIRO Divisions have collaborative arrangements with universities to foster PhD studies in particular areas. For example, CSIRO Marine and Atmospheric Research and the University of Tasmania run a joint PhD Program, which provides opportunities for students to undertake research projects that apply mathematics and statistics to marine science problems of local, national, regional and global significance.

AWARENESS OF SCIENCE BY CSIRO STAKEHOLDERS

In 2013, CSIRO commissioned Ogilvy Illumination to conduct the third online tracking survey into community attitudes towards CSIRO. Results confirmed that when Australians think about science and research in Australia, CSIRO is still the first organisation that comes to mind, see Figure 2.20 on page 68. However, as in 2010 and 2011, while awareness of CSIRO is still high among the community, knowledge of CSIRO's achievements is relatively low.

The study provided greater insight into what types of people were more likely to be engaged with CSIRO and with science and technology stories, and what

TABLE 2.11: SCIENCE OUTREACH: CSIRO'S POSTGRADUATE STUDENTS AND POSTDOCTORAL FELLOWS AS AT 31 MAY 2013

	2008–09	2009–10	2010–11	2011–12	2012–13
Sponsored postgraduates[a]					
PhD	338	375	333	291	294
Masters	9	13	24	20	16
Honours	17	25	19	17	22
Total	**364**	**413**	**376**	**328**	**332[b]**
Supervised postgraduates[a]					
PhD	629	733	655	639	642
Masters	56	47	59	77	68
Honours	58	60	77	64	82
Total	**743**	**840**	**791**	**780**	**792**
Postdoctoral Fellows	**304**	**330**	**333**	**326**	**324**

(a) A student may be either sponsored, supervised or both. The total number of individual students sponsored and/or supervised was 832, including more than 34 supervised in collaboration with Cooperative Research Centres and 62 through the Flagship Collaboration Fund. See glossary page 193 for definition of sponsorship and supervision.

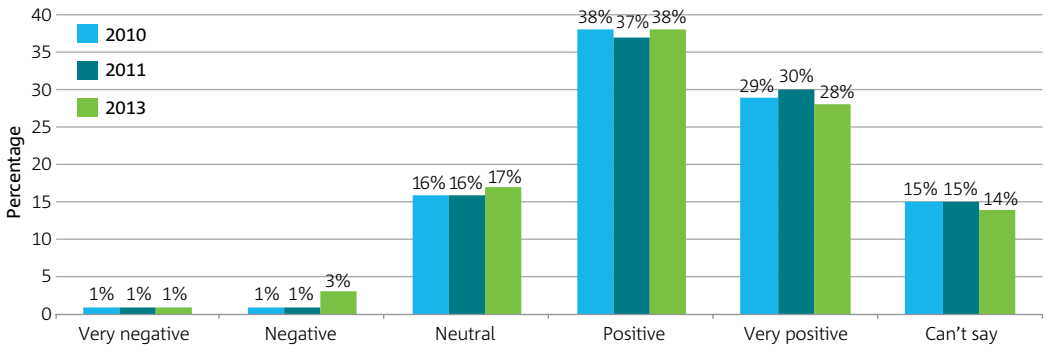
(b) Includes 43 students fully sponsored and 289 students partially sponsored by CSIRO.

types of people were less interested, enabling the Organisation to better align different messages with different audiences.

Despite several negative stories about CSIRO in the media during the survey period that rated as having relatively high awareness among the general public, this did not translate into a marked increase in negative perceptions of CSIRO as a result, confirming that community trust in CSIRO is still very high, with nearly 80 per cent rating it as trustworthy and over 56 per cent of the public rating it as extremely trustworthy.

> *"Australians strongly agree that CSIRO's scientists are there to make a difference (63%), that CSIRO is a world-class science agency (60%), is making a positive impact on tomorrow (60%), is creating a better future for all Australians (59%) and is the trusted advisor to the Australian government and industry (55%)."*
>
> CSIRO – Community Attitudes Research, Ogilvy Illumination, 2013

Figure 2.20: Community awareness



Q. Is your overall impression of CSIRO, very positive, positive, neutral, negative or very negative? If you are not sure whether your perception of CSIRO is positive or negative please answer 'Can't say'. 2013 n = 647, roughly half of the survey sample which was conducted in two phases.

For more information on community awareness see ESM4 on page 10.

EVIDENCE OF SUCCESS IN THE SCIENCE OUTREACH PROGRAMS

Over 6,000 teachers were surveyed in relation to the CSIRO hands-on science programs. Over 95 per cent of these teachers thought that the programs were likely to have a lasting impact.

CarbonKids and BHP Billiton Science and Engineering Awards both began a new cycle of funding in 2012, and evidence of impact will be assessed in upcoming years. It is planned that Scientists and Mathematicians in Schools will begin to measure and evaluate the long-term effectiveness of the programs from January 2014.

Attendance from interstate schools for CSIRO Discovery Centre's education program was around 43,000 students this year. CSIRO Discovery's contribution to the region's National Science Week program saw 35,000 visitors to the Centre in a single week. The Centre's management of the government initiative 'Inspiring Australia' has overseen a number of high-profile events, including a Café Scientifique on 'What is shaping the future of Australian sport?' This year our outreach programs featured heavily in the Centenary of Canberra program and our film festival, SCINEMA, contributed a program on Australian science to the government's OzFest cultural program in India. This promoted science careers at 120 schools and universities in the subcontinent.

Education and Outreach programs at the CDSCC attracted 12,430 school students and educators during 2012, an increase of seven per cent. Surveys performed with educators show that schools continue to be highly positive of our programs, and repeat bookings for 2014–15 continue to be strong. The Complex was heavily featured in the media for its key role in the landing of NASA's Mars Curiosity rover, with excellent national coverage received across traditional, online and social media.

The Parkes radio telescope visitors centre measures quality of visitor experience in monthly exit surveys. In 2012, 469 surveys were collected. Ninety-four per cent of visitors rated their experience at the Parkes radio telescope visitors centre as 'good' or 'very good'. New resources produced for the school group visits program also drew positive comment from teachers.

A view of the Parkes Observatory Visitors Centre and surrounding grounds.
Image: Parkes Shire Council and Mark James Photography

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 2012–13, 26 journals were published by **CSIRO** PUBLISHING. Fourteen were published in partnership with the Australian Academy of Science, a relationship that has been in place since 1948. Twelve journals were produced under agreements with Australian and international societies or institutions. Additionally, the special issues of journals were published in cooperation with societies in the US, Japan, Korea and New Zealand during the period.

Research institutions around the world chose to subscribe to the journals with 28 per cent from USA/Canada, 17 per cent from UK/Europe, 12 per cent from Asia, and four per cent from the rest of world. Thirty-nine per cent of subscribers are from Australia/New Zealand.

The journals are available to developing countries for free through the United Nations program Research4Life. This program fosters scientific understanding and education in developing nations.

Online use of the journals resulted in 2,641,160 articles being downloaded. This decrease from the previous year can be attributed to the end of a contract to publish a journal with **CSIRO** PUBLISHING.

ECOS, the online magazine about science for sustainability saw a significant increase in downloads in response to its more frequent publication (see Table 2.12).

New book titles

During the reporting year, **CSIRO** PUBLISHING released 42 book titles, all in print and digital formats. The digital books comprised approximately 12 per cent of sales, an increase of two per cent on the previous year. A highlight among the titles was the work *Desert Lake: art, science and stories from Paruku*, which combined artistic, scientific and Indigenous views of a striking region of north-western Australia.

Net profit

A positive net profit of $770,848 was delivered for 2012–13 (18.3 per cent more than anticipated). **CSIRO** PUBLISHING's total revenue for the period was $9,430,328. The market continued to see greater sales of digital products at levels that match publishing industry trends.

TABLE 2.12: CSIRO PUBLISHING

	2008	2009	2010	2011	2012
CSIRO PUBLISHING journal (downloads)	1,686,320	2,092,283	2,633,703	2,653,848	2,641,160
ECOS story (downloads)	204,225	200,740	241,525	296,448	454,385

PROGRAM 4
National Research Infrastructure: National Facilities and Collections

OBJECTIVES AND DELIVERABLES

CSIRO hosts National Research Infrastructure on behalf of the scientific community to assist with the delivery of research. There are two types of National Research Infrastructure: National Research Facilities and National Biological Collections. In addition, CSIRO hosts 30 other research facilities and over 30 national reference collections.

National Research Facilities are available for use by Australian and international researchers and are not restricted to CSIRO personnel.

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, biogeographical and ecological research and are a vital resource for conservation and research.

Program performance

The performance of CSIRO's National Research Infrastructure Program is assessed through six key performance indicators. Table 2.13 provides a summary of progress. More detailed analysis and trend data follow the Table.

We cover up to **99%** of Australian species within the faunal and floral groups under our care.

We are building a **new state-of-the-art** Marine Research Vessel the *Investigator* to replace the 42-year-old *Southern Surveyor.*

We are the custodian of **four national biological collections** and over 20 smaller collections of interest that contribute to the understanding and conservation of Australia's biological diversity.

TABLE 2.13: 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	CSIRO maintained the levels of availability and supported an increase in the use of the National Research Infrastructure under its custodianship.
Maintenance and operation of National Research Infrastructure	Meet international standards	Compliance with relevant Australian and International Standards was achieved. Initiatives to strengthen and enhance the maintenance and operation standards for all National Research Infrastructure were also undertaken in 2012–13.
Coverage of National Biological Collections	Maintain or increase	The coverage of Australian species in the National Biological Collections was maintained in line with previous years. The Australian National Fish Collection increased by two per cent from 2011–12.
Proportion of National Biological Collections digitised and available to the public	Maintain or increase	The proportion of the National Biological Collections digitised was maintained, with the exception of the National Wildlife Collection which increased by one per cent from 2011–12.
Response to national events	Timely response	CSIRO successfully launched a world-first vaccine for the Hendra virus – Equivac®. On behalf of the United Nations Food and Agriculture Organisation, the Australian Animal Health Laboratory (AAHL) also produced test kits to detect the new avian influenza strain among Asian poultry, which has now been supplied to laboratories in over 13 countries.
Scientific contributions in support of research	Demonstrated high-quality contributions	CSIRO's National Research Infrastructure continues to provide significant support and opportunities for collaboration with Australian and international scientific communities. For example, an international team of astronomers used the Parkes telescope to detect enormous 'geysers' of gas in our Galaxy which has provided additional understanding of galaxy formation and evolution.

Green shading: indicates positive progress for the year and the target has been achieved. **Yellow shading:** indicates some challenges have occurred during the year, but they were managed. **Red shading:** indicates challenges have affected progress and resulted in the target not being achieved. **White/no colour:** indicates that this is the first year results have been recorded for this indicator therefore no trend can be observed.

NATIONAL RESEARCH FACILITIES

CSIRO operates a range of specialised laboratories, scientific and testing equipment, and other research facilities. The three major National Research Facilities, classified as landmark facilities, are:

The Australian Animal Health Laboratory (AAHL)

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.

MAINTENANCE AND OPERATION OF NATIONAL RESEARCH INFRASTRUCTURE

Indicator: All National Research Infrastructure maintained and operated to international standard.

As a crucial part of Australia's biosecurity infrastructure, maintaining the integrity of the AAHL 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.

AAHL PC4 Zoonosis Suite (previously called the AAHL Collaborative Biosecurity Research Facility) was used extensively during the testing and development of the Hendra virus vaccine that was released for provisional use in horses in late 2012. The PC4 Zoonosis Suite is routinely used to investigate the comparative pathogenesis and immunology of Hendra and Nipah viruses in bats, and to perform routine national diagnostic testing procedures that require handling of the live Hendra virus (see page 23 for more information about the Hendra vaccine).

To ensure best practice in aspects of biocontainment and to uphold the quality and integrity of our research, AAHL aims to maintain or exceed the many regulatory requirements. AAHL continues to retain accreditation to ISO/IEC 17025:2005 and certification of its management system to AS/NZS ISO 9001:2008 and environmental management system to AS/NZS ISO 14001:2004. AAHL expanded its function as an international proficiency testing provider in 2012 for exotic disease agents and has maintained accreditation to ISO/IEC17043. The facility is operating with all of its facilities certified by the Department of Agriculture, Fisheries and Forestry, the Office of the Gene Technology Regulator and the Department of Health and Ageing's Security Sensitive Biological Agent legislation. The safety of staff is paramount at all times and a rigorous program of microbiological and safety training is provided throughout the year.

The Australia Telescope National Facility (ATNF)

ATNF is operated and managed by CSIRO's Division of Astronomy and Space Science, is made up of radio telescopes at three observatories, near the towns of Parkes, Coonabarabran and Narrabri in New South Wales. 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. All 36 antennas are now in place and are progressively being outfitted with radio-frequency receivers and commissioned.

ATNF also continues to maintain and upgrade its existing instrumentation. New wide bandwidth receivers, sensitive to radio signals in the four centimetre wavelength band, were installed on all antennas of the Australia Telescope Compact Array – this increases the sensitivity of the telescope to better pick-up faint sources of radio emission from across space. A new Telescope Protection System was commissioned at the Parkes Telescope to ensure the telescope and its systems are safely protected. The telescope is a massive piece of infrastructure (the dish is 300 tonnes) which has motors, gearboxes, brakes and moving parts. The protection system enables the safe and unattended operation of the telescope by remotely located observers.

UTILISATION OF THE NATIONAL RESEARCH INFRASTRUCTURE

Indicator: Utilisation of the National Research Infrastructure (the number of loans, visitor days, research days, observation time or operation time).

The Mopra telescope is now operating under a new model, with funding from the National Astronomical Observatory of Japan, the University of New South Wales, and the University of Adelaide. These groups support the operation of the telescope and are provided dedicated access in return. Infrastructure at the Mopra Observatory suffered significant damage in a bushfire in January 2013, but critical equipment was unharmed, and the telescope restored to operation in May.

The telescopes of the ATNF continue to be oversubscribed, see Table 2.14. International astronomers account for half the user community, with CSIRO staff and other Australian researchers sharing the remainder of the time. Observing time is determined on scientific merit of the proposals received. Over 75 per cent (target is to exceed 70 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 almost 20 per cent of the time. Time lost during scheduled observations due to equipment failure remained below five per cent, which is in line with other observatories. Over 100 papers using ATNF data were also published in refereed journals in 2012.

The Marine National Facility (MNF)

MNF is under the direction of an independent Steering Committee and managed by CSIRO's Division of Marine and Atmospheric Research. MNF is made up of a 66-metre blue-water research vessel, *Southern Surveyor*, a package of unique scientific equipment and a collection of 28 years of marine data. It has the scientific, technical and administrative expertise required to safely and effectively manage an ocean-going research platform. CSIRO is managing a major project to design and build a new state-of-the-art research vessel, the 94-metre RV *Investigator*, scheduled to be delivered in late 2013 to replace the *Southern Surveyor*.

UTILISATION OF THE NATIONAL RESEARCH INFRASTRUCTURE

Indicator: Utilisation of the National Research Infrastructure (the number of loans, visitor days, research days, observation time or operation time).

MNF provided 203 days (58 per cent) of ship time grants out of 390 days requested by researchers. This figure now includes transit voyages utilised for student training and opportunistic science and results in the slight increase in the days observed, see Figure 2.21. In addition, there were 21 research charter days.

Figure 2.21: Access to the Marine National Facility

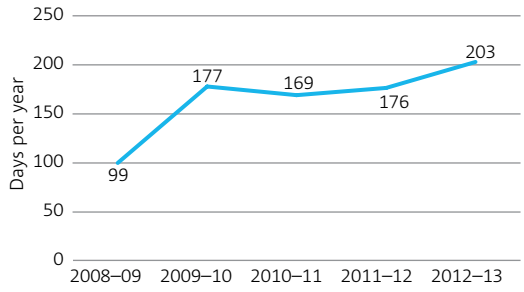


TABLE 2.14: UTILISATION OF NATIONAL RESEARCH FACILITIES[46]

Access to National Research Infrastructure	2008–09	2009–10	2010–11	2011–12	2012–13
Australia Telescope National Facility*					
Time allocated to observations (%)	76	75.3	72.4	73.6	76.7
Time lost to equipment failure (%)	3	2.9	3.1	2.7	2.7
Time allocated to CSIRO staff (%)	20	24	24	22	22
Time allocated to other Australian researchers (%)	30	23	25	21	28
Time allocated to international researchers (%)	50	53	51	57	50

*More information can be found in the ATNF's Annual Report, see: www.atnf.csiro.au/AR2012

46 Figures are determined for ATNF observing semesters so that, for example, the 2012–13 figures apply to the period 1 April 2012 to 31 March 2013.

Participants included scientists from 18 Australian institutions including the Antarctic Climate and Ecosystems Cooperative Research Centre, the Australian National University, the Bureau of Meteorology, the Museum and Art Gallery of the Northern Territory, Earthwatch, Geoscience Australia, James Cook University, Macquarie University, the South Australian Research and Development Institute, the University of New South Wales, the University of Tasmania, the University of Western Australia, the University of Wollongong and collaborating scientists from institutions in China, Germany, Japan, New Zealand, Spain, the United Kingdom and the USA.

The development of the next generation of marine researchers was enhanced by enabling 33 students to experience scientific work at sea in the MNF's *Next Wave* program. This program enables institutions to propose training and education activities for onboard delivery that integrates with campus based studies, and provides a unique opportunity for early career researchers and students of marine science to experience the working environment of Australia's only blue-water research vessel.

MAINTENANCE AND OPERATION OF NATIONAL RESEARCH INFRASTRUCTURE

Indicator: All National Research Infrastructure maintained and operated to international standard.

CSIRO is building a new state-of-the-art MNF research vessel RV *Investigator* to replace the current vessel *Southern Surveyor*. The 42-year-old *Southern Surveyor* will continue research voyages until September 2013 and will then be decommissioned. The new vessel, RV *Investigator*, is nearing completion and is due in Hobart later in 2013 to commence a commissioning program. Interest in the new vessel remains high with progress being reported to the public through a CSIRO blog – http://csirofrvblog.com.

NATIONAL BIOLOGICAL COLLECTIONS

COVERAGE OF NATIONAL BIOLOGICAL COLLECTIONS

Indicator: Coverage of National Biological Collections (percentage of known species).

CSIRO is the custodian of four National Biological Collections:

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

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

The National Biological Collections provide up to 99 per cent coverage of Australian species (see Table 2.15), although in the national context the collections have focused on building strength in particular areas.

TABLE 2.15: COVERAGE OF THE NATIONAL BIOLOGICAL COLLECTIONS

	Proportion of diversity covered (%)			
Collection	**2009–10**	**2010–11**	**2011–12**	**2012–13**
Australian National Insect Collection	70	70	70	70
Australian National Wildlife Collection	Birds – 99 Other vertebrates – 55	Birds – 99 Other vertebrates – 55	Birds – 99 Other vertebrates – 55	Birds – 99 Other vertebrates – 55
Australian National Fish Collection	50	54	57	59
Australian National Herbarium	70	70	70	70

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 Platform on Biodiversity and Ecosystem Services 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 (GRDC)). In each case the collections make a crucial contribution by providing unique biodiversity reference datasets that represent the highest quality comprehensive, up-to-date, geocoded, biologically accurate, digitised inventories of Australian biodiversity assets.

The National Biological Collections continue to be widely accessed by a range of users. Metrics for 2012–13 remain largely comparable to those for the previous year. Greater access to collections data via web portals such as the *Atlas of Living Australia, Australia's Virtual Herbarium* and the *Online Zoological Collections of Australian Museums* has contributed to sustained demand for access to specimens by external researchers (see Table 2.16).

The creation of the Australian National Biological Collections Facility (ANBCF) Theme in 2012 has facilitated greater interaction between the individual collections, in both research and specimen management. For example, the ANBCF is currently undertaking an evaluation of 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. Similarly, a proposal to study the evolution of the biota of southern Papua New Guinea (and how it is related to that of northern Australia) is bringing together researchers and specimen data from across the major collections. Pilot funding for the first 12 months of this work, focusing on plant biodiversity, has been secured from the Department of Sustainability, Environment, Water, Population and Communities. This project will facilitate digitisation of New Guinea specimens in the ANBCF and deliver data to our regional neighbours for biodiversity inventory and environmental risk assessment. It will also provide opportunities for regional capability building biodiversity science.

This year the Australian National Insect Collection (ANIC) experienced a considerable increase in demand for beetle tissue resulting from a high-profile project documenting this mega-diverse group. ANIC research days have also significantly increased with several collaborators visiting for six months and longer.

TABLE 2.16: COMBINED UTILISATION OF NATIONAL BIOLOGICAL COLLECTIONS

Use of National Biological Collections	2008–09	2009–10	2010–11	2011–12	2012–13
Number of specimens dispatched	7,800	29,300	25,925	15,548	13,660
Outward going loans	138	147	193	157	153
Tissue samples sent	3,300	3,800	4,447	3,819	2,415
Tissue sample grants	79	44	40	43	74
Number of visitors hosted	155	186	336	267	238
Total visitor research days	**403**	**713**	**551**	**800**	**1,066**
Number of tours hosted	47	57	70	52	67
Total number of visitors on tours	**535**	**597**	**1,266**	**363**	**586**

DIGITISATION OF COLLECTIONS

PROPORTION OF NATIONAL BIOLOGICAL COLLECTIONS DIGITISED

Indicator: Proportion of National Biological Collections digitised and available to the public.

The proportion of specimen level material digitised in the four collections ranges from five to 100 per cent, see Table 2.17.

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) see: **www.ala.org.au**

The ANWC's collections of birds, mammals, reptiles and amphibians comprise dried skins, skeletal specimens, whole specimens in alcohol and eggs. They have been almost completely digitised, even as the collection grows. Four thousand files of bird vocalisations from the Sound Library are available for download from the ALA.

The 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* (**www.ozcam.org.au**) and the ALA.

The majority of ANH Australian specimen records are digitised, with 100 per cent available through *Australia's Virtual Herbarium* (**www.avh.chah.org.au**) and the ALA. Preparation for a new project to digitise ANH specimens from Papua New Guinea has also commenced. All type collections are now being imaged as part of a joint initiative across Australian herbaria, funded by the Mellon Foundation.

DEMONSTRATED RESPONSE TO NATIONAL EVENTS

Indicator: Demonstrated response to national events.

November 2012 saw the successful launch of Equivac® – the Hendra virus vaccine. AAHL has worked in close partnership with Zoetis Australia (formerly Pfizer Animal Health), the Uniformed Services University of the Health Sciences and the Henry M Jackson Foundation for the Advancement of Military Medicine to bring this discovery from the laboratory to market, for use in horses by registered veterinarians (more on page 23).

On behalf of the United Nations Food and Agriculture Organisation, AAHL has also delivered as an international reference laboratory for animal influenzas, producing reagent test kits to detect the new avian influenza strain A (H7N9) amongst Asian poultry. These test kits have now been supplied to laboratories in over 13 countries.

TABLE 2.17: DIGITISATION OF THE NATIONAL BIOLOGICAL COLLECTIONS

	Proportion of collection digitised (%)			
Collection	**2009–10**	**2010–11**	**2011–12**	**2012–13**
Australian National Insect Collection	2.9	5	5	5
Australian National Wildlife Collection (excluding sound collection)	86	91	91	92
Australian National Fish Collection	100	100	100	100
Australian National Herbarium	76	76	76	76

SCIENTIFIC CONTRIBUTIONS IN SUPPORT OF RESEARCH

Indicator: Demonstrated high-quality scientific contributions in support of National Research Flagships, CSIRO Core Research and external users.

This section highlights some of the high-quality scientific contributions made by the National Facilities and Collections in 2012–13.

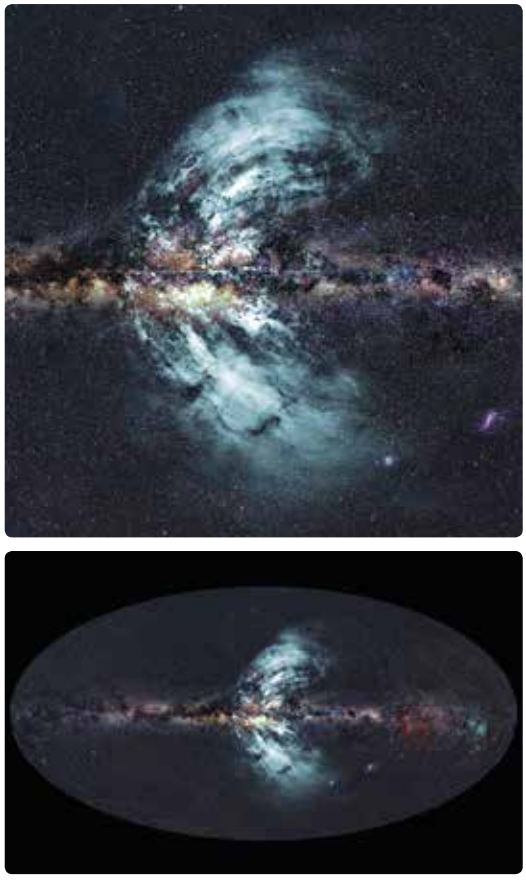
Australian Animal Health Laboratory

During 2012–13, AAHL researchers reported a world-first discovery that mosquitoes can mount an immune response to zoonotic viruses, such as West Nile virus, by secreting specific antiviral proteins when infected by the virus. This foundational discovery establishes the possibility that vector-borne diseases transmitted by insects might be counteracted by modifying the insect's own immune system, or that these newly-discovered antiviral proteins produced by insects could form the basis for new classes of antiviral drugs.

Dr Jean-Bernard Duchemin, CSIRO Research Scientist, working in AAHL's high-containment insectary.

Australia Telescope National Facility

An international team of astronomers used the Parkes telescope to detect enormous 'geysers' of gas in our galaxy. These massive outflows of charged particles, which emanate from the centre of our galaxy and stretch more than halfway across the sky, correspond with regions of gamma-ray emission detected with NASA's Fermi space telescope in 2010, which were dubbed the 'Fermi Bubbles'. The research was reported in the science magazine *Nature* and provides us with additional understanding of galaxy formation and evolution.



The 'geysers of gas' (pale blue) from the Galactic Centre. The background image is the whole Milky Way at the same scale. Credits: Ettore Carretti, CSIRO (radio image); S-PASS survey team (radio data); Axel Mellinger, Central Michigan University (optical image); Eli Bressert, CSIRO (composition).

Marine National Facility

Following underwater landslides of marine sediment off Queensland's southern coast in 2008, University of Sydney researchers onboard the MNF research vessel, *Southern Surveyor*, studied the sea floor to determine the potential for future tsunami-forming landslide events in this region. The *Southern Surveyor* was also instrumental in finding a wreck site which enabled the New South Wales Government to identify the MV *Limerick*, which was sunk by torpedo in 1943.

In addition, CSIRO deployed and serviced Integrated Marine Observing System deep sea moorings in the Southern Ocean, Timor Passage and the Indian Ocean, in partnership with the University of Tasmania. The moorings monitor conditions in the ocean and atmosphere from year to year. Information collected from these moorings is used to improve the understanding and prediction of climate change processes on a national and global scale.

Later in 2013, arrival of the new MNF vessel *Investigator* will greatly increase the scientific capability for Australian marine researchers and their international collaborators to work in the furthest reaches of our vast marine estate, including to the Antarctic ice edge, with larger teams covering many fields of research.

The new MNF vessel, *Investigator*, is nearing completion and will greatly increase Australia's research capability. Image: Chris Dickinson

Australian National Insect Collection

During 2012–13, ANIC researchers, using taxonomy, which describes new species and how they relate to each other in a classification, produced revised information on various insect groups. Working with organisations such as the British Natural History Museum and the Chinese Academy of Sciences, CSIRO scientists looked at the evolution of fruit flies, thrips and beetles using molecular genetic datasets. The highly-anticipated taxonomic revision of the iconic Australian scribbly-gum moth made a significant impact in international journals and through social media outlets. ANIC researchers were the first to uncover the way in which the scribbles are made by moth larvae, along with the biology and lifecycle of the moths responsible. In the process they described eleven new species of moth and redefined how scribbly-gum moths fit into the moth family tree.

Honorary Research Fellow, Dr Marianne Horak, has uncovered the mechanism responsible for the scribbles on the scribbly-gum and described 11 new species of scribbly-gum moth (*Ogmograptis* sp.)

Australian National Wildlife Collection

A long-running theme of the ANWC's research is the past and present genetic connections between the closely-related faunas of Australia and our nearest neighbour Papua New Guinea.

CSIRO scientists are researching species of waterfowl and savanna birds in both countries to understand the complexity of these genetic connections. Additionally, waterbirds are believed to be a primary reservoir of viruses involved in the transmission of avian influenza. CSIRO is building critically important partnerships with Papua New Guinean researchers and students to better understand links between biodiversity and human health.

Wandering Whistling-Duck *Dendrocygna eytoni*, which has featured in ANWC research on genetic connectivity between northern Australia and Papua New Guinea. Image: Julian Robinson

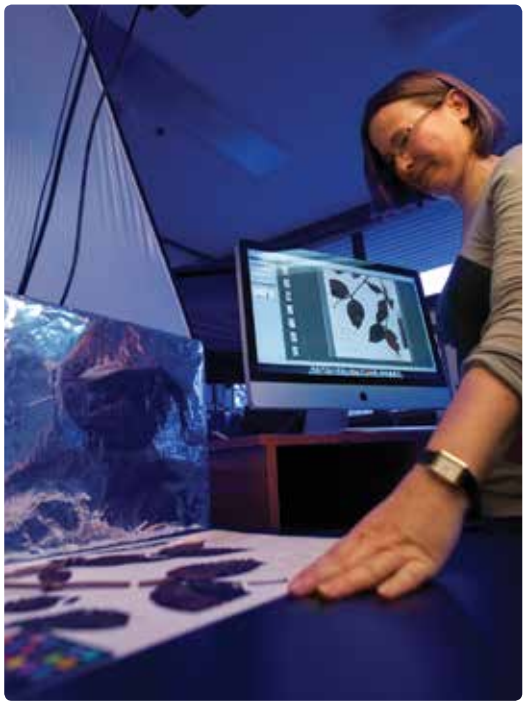
Australian National Fish Collection

During 2012–13, the ANFC provided support and taxonomic and imaging expertise to projects such as CSIRO's *Guide to Mesopelagic Fishes of the Southern Tasman Sea*, and the recently launched FishMap (**www.fish.ala.org.au**). FishMap, a collaboration between CSIRO's Wealth from Oceans Flagship and the ALA, is an online spatial mapping and identification tool for Australian marine fishes (about 4,500 species). FishMap is already being used by Australian Fisheries Management Authority and the Department of Sustainability, Environment, Water, Population and Communities to assist management objectives.

Yellowstripe Scad (Smooth-tailed Travally). Image: William White

Australian National Herbarium

ANH has been actively involved this year in the JSTOR (journal storage) Global Plants Initiative, a community-contributed online database of high-resolution images of plant type specimens for scientific researchers, conservationists and others engaged in studying the world's plant biodiversity. Type specimens act as a reference point for plant names and are of critical importance in determining their correct application and use. The ANH holds over 9,000 type specimens, dating back as far as the late 18th century. Digital imaging of these collections allows researchers worldwide ready access, while minimising the risk of damage to these fragile and irreplaceable specimens. Herbarium staff also led a GRDC-funded project to examine the effects of cropping intensification on biodiversity in the high rainfall cropping zone of south-east and south-west Australia to develop management strategies to maximise species persistence.



CSIRO's Bronwyn Collins taking high-resolution images of herbarium type specimens for the Global Plants Initiative project.

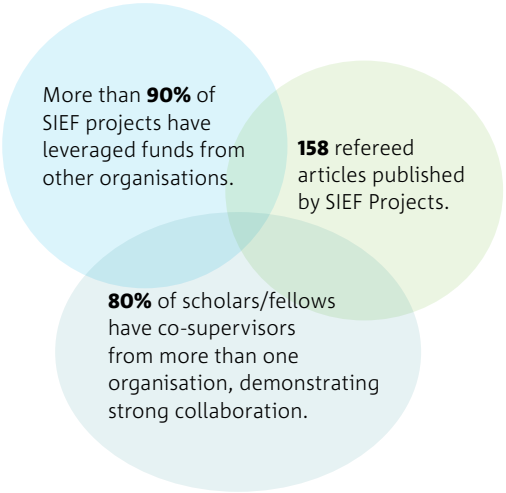
PROGRAM 5
Science and Industry Endowment Fund

SIEF – OBJECTIVES AND DELIVERABLES

The Science and Industry Endowment Fund (SIEF) is a separately constituted trust under the *Science and Industry Endowment Act 1926* and makes strategic investments in scientific research for the purpose of supporting scientific and industrial research for the benefit of Australia and its people.

The SIEF makes strategic investments in scientific research that addresses issues of national priority for Australia. The Fund invests in science that contributes to Australia's sustainable future, such as:

- fundamental research for sustainable resource use, environmental protection and community health
- tactical research addressing solutions to national challenges
- collaborative research that brings together organisations capable of working together on solutions to national challenges
- scholarships that create and sustain young researchers capable of addressing national challenges.



Recognising that science has been, and will be, a key driver of the economic, industrial, environmental, and cultural development of Australia, the SIEF invests in research that will contribute to the sustainable growth of Australia.

The Chief Executive of CSIRO, Dr Megan Clark, is the Trustee of the Fund. Dr Clark is assisted by the SIEF Advisory Council, which provides independent advice and recommendations to the Trustee in relation to the making of grants and funding of proposals out of the assets of the SIEF. The Fund is managed by CSIRO on behalf of the Trustee.

Funding is awarded by the Trustee, with advice from Australian and international experts, to proponents from across the National Innovation System. Some of the programs are operated on a competitive basis, and others are operated by invitation on the basis of identified needs of the Australian science community.

SIEF delivers funding via a number of programs:

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

SIEF – PROGRAM PERFORMANCE

The performance of SIEF is assessed through four performance indicators. Table 2.18 provides a summary of progress. More detailed analysis follows the Table.

TABLE 2.18: PERFORMANCE INDICATORS FOR PROGRAM 5 – SIEF[47]

Key performance indicator[48]	2011–12	2012–13
Proportion of projects involving research in areas of national priority	100% Research Projects 76% Promotion of Science	100% Research Projects, Research Infrastructure and Special Research Programs 83% Promotion of Science
Proportion of projects involving more than one organisation	more than 85%	more than 90%
Financial contributions of partners	approximately 57%	approximately 69%
Number of publications from SIEF projects	79	158[49]

Green shading: indicates positive progress for the year and the target has been achieved. **Yellow shading:** indicates some challenges have occurred during the year, but they were managed. **Red shading:** indicates challenges have affected progress and resulted in the target not being achieved. **White/no colour:** indicates that this is the first year results have been recorded for this indicator therefore no trend can be observed.

Key performance indicators for SIEF have been chosen to address the objectives of the early stages of this program. New performance indicators are being added in the future as the programs mature.

PROPORTION OF PROJECTS INVOLVING RESEARCH IN AREAS OF NATIONAL PRIORITY

A key selection criterion for all funded programs is how the project will contribute to the nation's response to the national challenges. This criterion is given greater emphasis for the more substantial Research Projects grants (resulting in 100 per cent alignment with National Research Priority areas). Examples include:

- the Ngara Research Project has created a new generation of very high performance wireless technologies that can be used outdoors over large distances at very high data rates. They complement current fibre optic and cellular phone technologies and may offer better access to wireless communications for rural and remote Australians.
- two Research Projects that address the effects of increased carbon dioxide in the atmosphere: *Solving the Energy Waste Roadblock*, which aims to develop new materials and processes for the capture and utilisation of carbon dioxide; and the newly-commenced *Forests for the future: making the most of a high CO_2 world* which aims to develop a new strategy that rapidly identifies tree species that exhibit a strong, positive growth response to elevated carbon dioxide.

More flexibility is allowed in the SIEF Promotion of Science (PoS) Programs which support early career researchers, primarily in the form of Postgraduate Scholarships and Postdoctoral Fellowships. An emphasis on awarding collaborative, cross-disciplinary projects has also resulted in an increase in the proportion of PoS grants that address national challenges, such as:

- Climate change-related projects that examine the functioning of coral reef networks under climate change; building better models for agricultural greenhouse gas mitigation; and understanding how vegetation allocates nutrient resources under different future climate scenarios.

47 For all projects awarded as at 30 June 2013.

48 Data includes Research Projects, Research Infrastructure, Promotion of Science, and Special Research Programs. Undergraduate Degree Scholarships are not included as even though they support the development of potential early career researchers, there is no expectation they will address national priorities, collaborate, co-invest or publish.

49 Cumulative for all projects awarded since 1 July 2011 up to 30 June 2013.

- Industry and manufacturing-related projects that include the recycling of e-waste metals and polymers for recovery of value-added materials, development of next generation biomedical materials, and looking at ways to mitigate the impending mobile network data volume crunch.
- Medical-related projects that provide greater understanding of age-related neurodegenerative disease, and developing genetic algorithms for Alzheimer's diagnosis and prognosis.

PROPORTION OF PROJECTS INVOLVING MORE THAN ONE ORGANISATION

Reflecting the SIEF objective of bringing together organisations capable of working together on solutions to national challenges, collaboration is a key (but not mandatory) selection criterion for all funded projects. Fifteen of the 17 SIEF-funded Research Projects are collaborations. The number of partners for Research Projects ranges between one and seven (average 3.5), with a total of 36 different partners being involved in one or more Research Projects. The Research Infrastructure and Special Research Programs are 100 per cent collaborations. Strong collaboration can also be seen in the PoS programs with over 90 per cent of scholars/fellows having co-supervisors from more than one organisation. International partners (academic and industry) feature in both the Research Projects as well as Scholarships/Fellowships programs. There has been a stronger emphasis on collaboration and industry/end-user involvement in later rounds of selection, resulting in an increase in the overall proportion of projects involving more than one partner. These partnerships will assist SIEF-funded Research Projects to remain competitive globally, promote enduring collaborations and create multidisciplinary teams that will benefit Australian science.

FINANCIAL CONTRIBUTIONS OF PARTNERS

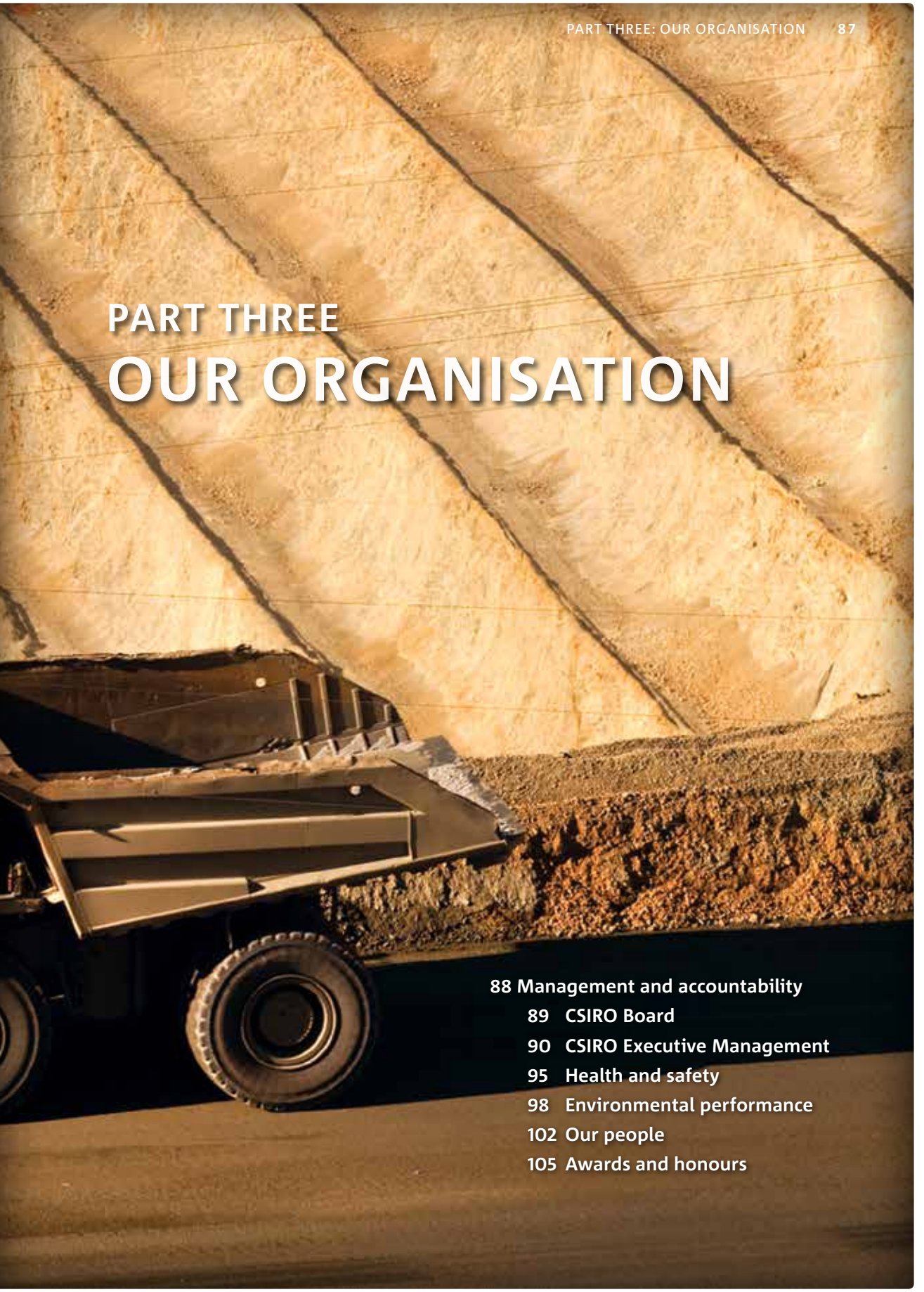
Commitment to collaborations can be seen by cash and/or in-kind co-contributions by grant recipients. A stronger emphasis on collaboration and industry/end-user involvement in later rounds of selection, and a greater requirement placed on co-investment for Research Infrastructure and the Special Research Program: Synchrotron Science has resulted in an increase in the overall co-investment rate for SIEF projects.

NUMBER OF PUBLICATIONS FROM SIEF PROJECTS

Publications are a lagging indicator for the science excellence of the projects funded by the SIEF. Projects generally have a three- to five-year lifespan and most have commenced relatively recently (2011–12). The publication of research findings generally occurs towards the end of the project. Although total publication numbers have increased from last year, these results are not yet mature enough to provide a true representation of SIEF's contribution to the academic knowledge of the projects respective research disciplines.

COAL MINES • **SETTING THE STANDARD FOR OPEN PIT MINES**

CSIRO has helped redefine large open pit mine design, ensuring mine slopes are reliable.



PART THREE
OUR ORGANISATION

Part three: our organisation

Management and accountability

OPERATING MODEL

CSIRO's Operating Model is designed to support the successful execution of our strategy and delivery of our goals. It defines the roles, relationships and accountabilities of leaders and operating units in CSIRO. It contains our processes for planning, investment, review and reporting, and the CSIRO Policy Framework.

Further information can be found at: **www.csiro.au/governanceoverview**.

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).

CSIRO's **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 CSIRO's operations are set out in the *Commonwealth Authorities and Companies Act 1997* (CAC Act).

Pursuant to a service agreement, CSIRO provides administrative support services to the Trustee of the SIEF consistent with the *Science and Industry Endowment Act 1926*. The Fund has its own governance structure.

In October 2012, 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 2012–13 under Section 28 of the CAC Act are: Commonwealth Fraud Control Policy; Australian Government Foreign Exchange Risk Management Guidelines; and Outsourcing of Information Technology Infrastructure Services. In addition, CSIRO has complied with the Commonwealth Procurement Rules as they apply to CSIRO.

RESPONSIBLE MINISTER

As at 30 June 2013[50] the responsible ministers were:

- The Hon Dr Craig Emerson MP, Minister for Tertiary Education, Skills, Science and Research
- Senator the Hon Don Farrell, Minister for Science and Research.

Other responsible Ministers during 2012–13 were:

- The Hon Chris Bowen MP, Minister for Tertiary Education, Skills, Science and Research from 4 February 2013 to 25 March 2013
- Senator the Hon Christopher Evans, Minister for Tertiary Education, Skills, Science and Research from 14 December 2011 to 4 February 2013.

50 Prime Minister Kevin Rudd was sworn in on 27 June 2013. The new Rudd Ministry sworn in on 1 July 2013 includes: Senator the Hon Kim Carr, Minister for Innovation, Industry, Science and Research, and Minister for Higher Education.

Under the SIR and CAC Acts, 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).

The Minister provides CSIRO with a Statement of Expectations and the Board responds with a Statement of Intent. These documents can be found at: www.csiro.au/resources/Statement-of-Expectations.html.

The Public Research Agency Charter, signed by the Minister and the Board, provides guidance to CSIRO and its researchers on providing scientific advice and engaging in public debate. The Charter can be found at: www.csiro.au/resources/pf1lc.html.

The 2011–15 Quadrennium Funding Agreement between the Government and CSIRO was signed in February 2013.

MINISTERIAL DIRECTIONS AND NOTIFICATIONS

No new directions were received in 2012–13. The CSIRO 2011–14 Enterprise Agreement was developed in accordance with the Ministerial direction regarding compliance with the Australian Government Employment Bargaining Framework.

Eighteen notifications of significant events under Section 15 and 16 of the CAC Act were made to the Minister during 2012–13. These related to participation in research centres and alliances, licence agreements, equity transactions and major research and infrastructure projects.

CSIRO Board

CSIRO is governed by a Board which is responsible to the Australian Government for the overall strategy, governance and performance of the 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.

On 1 July 2012 the importance of overseeing risk and health and safety was recognised by reconstituting the Board committees. The Board also adopted revised Charters for the Board and the Board committees that expressed responsibilities more in terms of the scope or objectives of the bodies. Operational aspects and the detailed duties were transferred to a Board Governance Document.

In 2012–13 the 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 the 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 the Board members, including qualifications and terms of appointment are on page 93. Details of remuneration, membership of Board Committees and

attendance at meetings, and related party directorships and associations are shown on pages 158 and 161–162 in the financial statements. The Board Charter and membership profiles are available at: **www.csiro.au/boardoverview**.

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 2012–13, the Board did not consider any transactions where a member of the Board was also a director of the other entity involved in the transaction.

CSIRO Executive Management

The Chief Executive conducts the affairs of the Organisation in accordance with the strategy, plans and policies approved by the Board and the Board Directions to the Chief Executive.

The Chief Executive is supported by the 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 94.

The Executive Team is assisted by two standing committees, the Science, Strategy, Investment and Impact Committee and the Major Transactions Committee. In addition, a Precinct Oversight Committee steers the implementation of that key element of the CSIRO Strategy. The CSIRO Health, Safety and Environment Committee is accountable to the Chief Executive.

The Executive Management Council of senior managers provides a forum for sharing and discussing issues relating to the management and future strategy for CSIRO.

Planning and monitoring performance

The CSIRO Strategy 2011–15 is the guiding document for planning and monitoring performance. (see: **www.csiro.au/resources/CSIRO-Strategy-2011-2015.html**)

The plan outlines the Organisation's broad objectives, policies and strategies to be achieved by 2015. In brief, the strategy emphasises CSIRO's intent to maintain its 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, CSIRO's portfolio of research is decided through a planning and budgeting process that is guided by the twin imperatives of seeking relevance and impact for Australia.

An Annual Directions Statement (ADS) outlines the Chief Executive's expectations of, and provides guidance to management for the planning and budgeting cycle. The first ADS, published in 2012–13, provided direction for development of the four-year organisational budget and operational planning for the 2013–14 financial year. It should be read in conjunction with, and complements, our 2011–15 Strategic Plan by linking long-term goals with short-term planning priorities designed to address current circumstances.

In accordance with the requirements of the SIR Act, the annual Operational Plan (see: **www.csiro.au/operational-plan**) sets out the strategies CSIRO proposes to pursue; the activities CSIRO proposes to carry out; and the resources CSIRO proposes to allocate to these activities. Specifically, it includes the annual delivery targets set by the Executive Team and agreed by the Board for the financial year in the form of Key Executive Actions (KEAs).

To ensure the Organisation is on track the Executive Team and Board receive regular updates on how CSIRO is performing against these plans, as well as regular performance reports against the annual KEAs, the Strategic Plan Enterprise Strategy Measures, CSIRO's Portfolio Budget Statements and other internal performance indicators.

The quality of our research is subject to scientific peer review mechanisms and the 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 page 20.

Risk management

CSIRO's Risk Policy recognises that the identification and management of risk is central to delivering the functions of CSIRO and delivering benefits to Australia.

CSIRO's risk management framework provides the methodology by which CSIRO's 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 is being progressively integrated into CSIRO's business activities and processes at all levels of the Organisation. In 2012–13, this integration involved enhanced risk identification, management and reporting at the executive level of the 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

CSIRO's Strategic Advisory Committees (SACs) provide advice on CSIRO's longer-term strategic directions and research and development priorities and on how CSIRO can meet the research, technical and business needs of customers or communities. The advice provided by the SACs may be complemented by Flagship Advisory Committees that focus more specifically on how to maximise the effectiveness of the Flagship portfolio to achieve its goals. The Committees comprise representatives from industry, government, non-government organisations and other stakeholders.

Committee details can be found at: **www.csiro.au/SAC** and **www.csiro.au/FAC**.

Policies, standards and procedures

The CSIRO Policy Framework comprises policies, standards and procedures. It is supported by the CSIRO Delegations and Authorities Framework.

The policy statements, approved by the Board, cover CSIRO's commitment in relation to:

- Science and Delivery
- People
- Governance
- Risk
- Health, Safety, Environmental Sustainability and the Community.

In 2012–13, the Board also reconfirmed CSIRO's policy on Freedom to Conduct CSIRO Research and Technology Transfer. The statements are available at: **www.csiro.au/org/Key-policy-statements.html**.

Standards and procedures introduced or amended this year include:

Standard

- Risk

Procedure

- Freedom of Information
- Information security
- Major projects
- Managing learning and professional development
- Membership and sponsorship
- Purchase and use of books and information resources
- Risk

A number of human resources and health, safety and environment procedures were amended as a result of the Improvement Notice issued by Comcare in 2012 as shown on page 97.

In addition, guidelines were released on topics such as cybersecurity whilst travelling overseas and on the personal use of social media.

Ethics and the Code of Conduct

The CSIRO Code of Conduct sets out the standard of behaviour expected of CSIRO and of everyone working in CSIRO. The Code aligns with our Values Compass and is a key component of our staff induction program.

In addition, CSIRO has procedures on ethical conduct in human research and on the care and use of animals for scientific purposes. CSIRO's practices comply with national codes and relevant state and federal legislative requirements.

Internal controls

Assurances about the Organisation's 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 a Whistleblower Scheme.

CSIRO complies with Commonwealth Fraud Control Guidelines (revised 2011). A Fraud Risk Assessment was completed in May 2012 and a revised Fraud Control Plan was released in September 2013.

CSIRO is transitioning towards meeting the mandatory requirements of the Australian Government Protective Security Policy Framework (PSPF) and the Information Security Manual. The Organisation is approaching compliance based on our business model and will 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.

In June 2013, Internal Audit completed a compliance audit against the mandatory requirements contained within the PSPF. The results of the audit will inform the PSPF Ministerial Compliance Report to be submitted to the Chief Executive for approval in August 2013.

Reviews by Outside Bodies

External audit is provided by the Australian National Audit Office.

During 2012–13, 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 or the Office of the Australian Information Commissioner.

The Senate Standing Committee on Economics examines the operations of CSIRO following the Federal Budget and the tabling in Parliament of the CSIRO Annual Report. This year senior executives appeared before the Committee on three occasions and responded to all related questions on notice.

The Committee reviewed the 2011–12 Annual Report and provided comments which have been addressed in this report.

Judicial Decisions

During 2012–13, there were no judicial decisions or decisions of administrative tribunals that have had, or may have, a significant affect on the operations of CSIRO.

Board membership 2012–13

From left to right: Dr Eileen Doyle, Ms Mary Boydell, Professor Peter Høj, Mr Simon McKeon AO (Chairman), Professor Tom Spurling AM, Dr Megan Clark (Chief Executive), Ms Jane Bennett and Ms Shirley In't Veld. Absent: Mr Hutch Ranck

CHAIRMAN

Mr Simon McKeon AO
BCom LLB FAICD
Company Director
28 June 2010 – 27 June 2015

DEPUTY CHAIRMAN

Dr Terry Cutler
BA (Hons) PhD Hon DUniv FAHA FIPA
Principal
Cutler and Company Pty Ltd
25 July 2002 – 24 July 2012

Dr Eileen Doyle
BMath (Hons) MMath PhD FAICD
Company Director
15 February 2006 – 14 February 2016
(Deputy Chairman from
25 October 2012)

CHIEF EXECUTIVE

Dr Megan Clark
BSc (Hons) PhD Hon DSc
Hon DApSc FTSE GAICD
1 January 2009 – 31 December 2014

MEMBERS

Ms Jane Bennett
Company Director
25 October 2012 – 24 October 2015

Ms Mary Boydell
BCom FCA
Company Director
26 June 2009 – 25 June 2014

Professor Peter Høj
MSc PhD DUniv (honoris causa) FTSE
Vice Chancellor and President
University of Queensland
7 December 2011 – 6 December 2014

Ms Shirley In't Veld
BCom LLB
Company Director
28 June 2012 – 27 June 2015

Mr Hutch Ranck
BSc Economics FAICD
Company Director
1 May 2011 – 30 April 2016

Dr Don Russell
BEc (Hons) MEc PhD CFA
Secretary, Department of
Industry, Innovation, Science,
Research and Tertiary Education
19 October 2011 – Resigned
2 November 2012

Professor 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

Executive Team membership 2012–13

From left to right, back row on stairs to front row: Dr Tom Hatton PSM, Ms Hazel Bennett, Mr Mike Whelan, Mr Craig Roy, Dr Alastair Robertson, Dr Calum Drummond, Dr Andrew Johnson, Mr Rod Bloom, Dr Megan Clark (Chief Executive), Dr David Williams.

Dr Megan Clark
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

Mr Mike Whelan
BEc
Deputy Chief Executive, Operations

Mr Rod Bloom
BA
Executive Director, Development

Ms Hazel Bennett
BSc (Hons) ACA FAIM
Chief Finance Officer
(Executive Director, Finance
and Services from 1 July 2013)

Dr Calum Drummond
BSc (Ed) BSc (Hons) PhD FTSE,
FAICD, FRACI, CChem
Group Executive, Manufacturing,
Materials and Minerals

Dr Tom Hatton PSM
BSc MSc PhD
Group Executive, Energy

Dr Andrew Johnson
BAgrSc (Hons) PhD MPA
Group Executive, Environment

Dr Alastair Robertson
BSc (Hons) PhD FRSC
CChem FIFST
Group Executive, Food, Health
and Life Science Industries

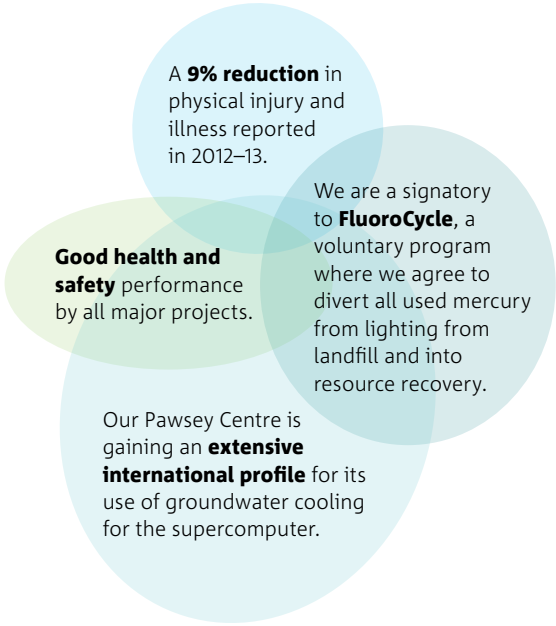
Dr David Williams
BSc PhD
Group Executive, Information
Sciences (from November 2012)

Mr Nigel Poole
LLB BCom FAICD
Acting Group Executive,
Information Sciences
(to November 2012)

Executive Team profiles are available at: **www.csiro.au/executiveteam**

Health and safety

CSIRO is committed to the health and safety of its staff and recognises the importance of positive interventions aimed at improving staff wellbeing. CSIRO acknowledges its responsibilities under the *Work Health and Safety Act 2011* and seeks to exceed these in striving to achieve its vision of Zero Harm. CSIRO has implemented a governance framework to ensure it can deliver upon its responsibilities and a summary of performance and compliance with this Act is provided below.



HEALTH, SAFETY, ENVIRONMENTAL SUSTAINABILITY AND COMMUNITY POLICY

CSIRO's Health, Safety, Environmental Sustainability and Community Policy reflects our commitment to ensuring the safety and wellbeing of our staff, visitors and the communities in which we work. This policy outlines what CSIRO will do in striving toward Zero Harm.

HEALTH, SAFETY AND ENVIRONMENT MANAGEMENT STANDARD

CSIRO's Health, Safety and Environment (HSE) Management Standard describes the mandatory performance requirements for the management of health, safety and environmental risks, and is applicable to all CSIRO staff, sites and facilities.

HEALTH, SAFETY AND ENVIRONMENT PROCEDURES

CSIRO's Health, Safety and Environment Procedures provide mandatory requirements for achieving the intent of our Policy and Management Standard. These procedures detail the responsibilities of our Senior Leaders, Managers and Staff for ensuring risks arising from our work are eliminated or minimised. CSIRO has adopted a continuous improvement of our procedures and in 2012–13 the following procedures were developed or revised:

- Radiation Safety
- Rehabilitation and Injury Management
- Plant and Equipment Safety
- Drug and Alcohol
- Electrical Safety
- Personal Protective Equipment
- Consultation and Representation
- International travel

HEALTH, SAFETY AND ENVIRONMENT GUIDELINES

CSIRO's Health, Safety and Environment Guidelines accompany many of our procedures, providing our staff with examples of recommended best practice and helpful tools to enable them to effectively meet the requirements of our governance framework.

HEALTH AND SAFETY STRATEGY

The 2011 to 2015 Health and Safety Strategy outlines initiatives that will improve CSIRO's health and safety performance and progress its safety culture. During 2012–13, the following strategic initiatives were delivered:

- A 360 degree HSE leadership review of our most senior leaders was undertaken.
- HSE leadership training was provided to over 800 CSIRO line managers.
- An enterprise Muscular Skeletal Injury Prevention program was scoped.
- HSE audit tools were developed for a peer review audit program.
- Management of risks associated with international travel was enhanced through an upgrade of our Staff International Travel System.
- A web-based health and wellness information portal was made available to staff.
- Consolidated occupational health monitoring requirements were established for the entire organisation.
- Focused on mental health. A web portal was established that provides a range of tools to assist managers and staff deal with psychological health and wellbeing. The web portal includes links to CSIRO information and services, as well as support services provided by external organisations. Specific training and information sessions facilitated by organisations such as *beyondblue* were held to support improvement in mental health literacy and understanding within CSIRO.

Other significant enterprise initiatives delivered in 2012–13 include a review of controls for the operation of quad bikes and a review of asbestos controls and registers across all sites.

HSE PERFORMANCE

CSIRO is required to report each year on injuries that occur in the course of its business and which result in lost time or require medical treatment, see Figures 3.1 and 3.2.

- CSIRO made a significant change to the criteria for classifying lost time injuries (LTIs) in 2010–11 to more closely align with industry best practice. This new system ensures reliable, accurate and standardised injury classification and surfaces injuries that otherwise may not have been reported. The increase in LTI rates between 2010–11 and 2011–12 was due to the new more stringent criteria for classifying lost time injuries.
- Fifty-four LTIs were reported during the year resulting in an LTI frequency rate of 4.9. The nine per cent reduction in the incidence of physical injuries in the reporting period was offset by a corresponding increase in reporting of stress and anxiety related illnesses.
- Eighty-six medical treatment injuries (MTIs) were reported during the year resulting in an MTI frequency rate of 7.8. This marginally higher MTI frequency rate compared to the previous period was in part due to an increase in early intervention treatments for muscular skeletal injuries. This early intervention approach is being actively encouraged to resolve and prevent muscular skeletal injuries from going on to develop to a more disabling level.
- Raising awareness of the need for staff to report mental health illnesses that may have a work related component has seen mental health related illness reports increase to approximately nine per cent of LTI and MTI reports.
- The number of workers' compensation claims with injury dates in the reporting period decreased from 60 in 2011–12 to 51 in 2012–13.
- CSIRO's premium for 2012–13 was 0.66 per cent of payroll compared with the Commonwealth agency rate of 1.77 per cent.

NOTIFIABLE INCIDENTS

Under the *Work Health and Safety Act 2011* CSIRO is required to report notifiable incidents (under section 38). A notifiable incident is classified as '...the death of a person; or serious injury or illness of a person; or a dangerous incident'. In 2012–13 there were 19 Comcare Notifiable Incidents reported during the year (three serious incidents and 16 dangerous incidents) see Figure 3.3.

NOTICES FROM REGULATORS 2012–13

- There were no Prohibition Notices or Improvement Notices issued in 2012–13.
- There were no Provisional Improvement Notices issues in 2012–13.
- Actions arising from the Comcare Improvement Notice issued to CSIRO near the end of the 2011–12 reporting period and referred to in the 2011–12 CSIRO Annual Report have been completed.
- There were no investigations of Notifiable Incidents conducted by Comcare in 2012–13.
- During 2012–13, the Australian Radiation Protection and Nuclear Safety Agency conducted five planned inspections and one unannounced inspection. One of the planned inspections (Toowoomba) resulted in three breaches of section 31(2) of the Act for failing to comply with conditions of source licence S0017. Relevant corrective actions have been deployed.
- CSIRO also self reported a potential noncompliance in relation to the installation and use of three water sterilisers which were not on the Division's source licence. Action has been taken (Reg 51 application) to rectify the potential noncompliance.
- There were no notifiable environmental incidents in the reporting period.

Figure 3.1: Total serious injuries (LTIs and MTIs)

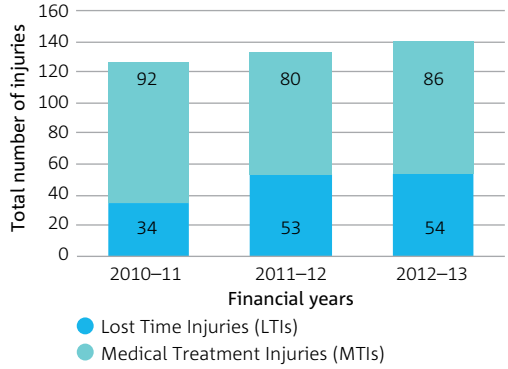


Figure 3.2: Lost time injury frequency rate

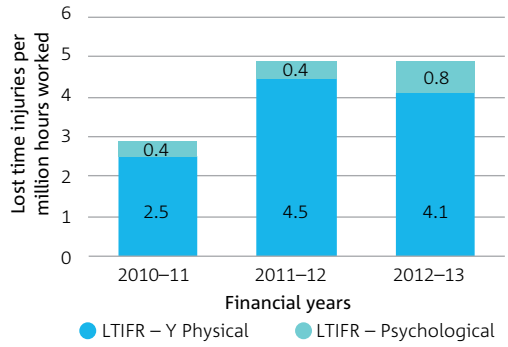
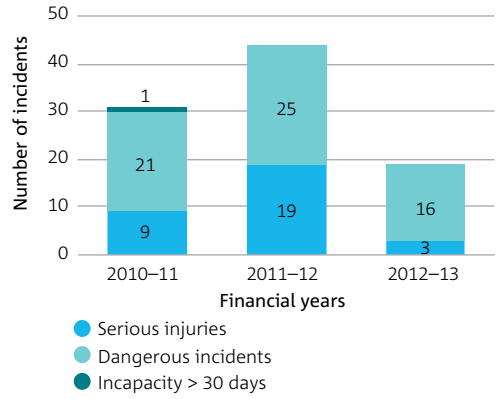


Figure 3.3: Number of notifiable incidents[51]



51 The *Work Health and Safety Act 2011* came into force on 1 January 2012, changing the criteria that determine which incidents must be notified to Comcare. This change partially accounts for the steep decline in the number of notifiable incidents since 2011–12.

Environmental performance

CONTRIBUTION TO ECOLOGICALLY SUSTAINABLE DEVELOPMENT

CSIRO upholds the principles of ecologically sustainable development (ESD) outlined in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) through both its operations and research activities.

To achieve its research goals, CSIRO operates numerous types of infrastructure, such as laboratories, glasshouses, farm properties and telescope facilities, as well as managing plants and livestock. Although these activities require significant quantities of energy and water and produce waste, the research outcomes contribute to ESD principles as shown in the examples listed in Table 3.1.

CSIRO'S ENVIRONMENTAL SUSTAINABILITY COMMITMENT

CSIRO's Environmental Sustainability Strategy (ESS) 2008–15 is designed to minimise the Organisation's environmental footprint, while CSIRO delivers sustainable science outcomes to external communities. The strategy impacts on our daily work practices and involves all staff.

Our waste reduction to landfill is on track to achieve the 50 per cent reduction target by 2015, while carbon emission reductions and reducing mains water consumption are proving challenging in light of new sites and expanded boundaries compared to 2008–09.

Consequently, CSIRO is reviewing its carbon emission reduction strategies with emphasis on long-term solutions, such as building efficiency and renewable energy solutions that provide sustainable energy and emission reductions.

CSIRO met all 2012–13 government compliance environmental data reporting requirements, including the National Greenhouse and Energy Reporting Scheme; Government Greenhouse and Energy Reporting, the National Pollution Inventory and relevant National Environmental Protection Measures.

CARBON AND ENERGY

CSIRO's ESS carbon program targets emissions derived from electricity, fuels, gas, refrigerants and air travel. Emissions from electricity and gas consumption comprise the majority of CSIRO's carbon footprint, expressed as kilotonnes of carbon dioxide equivalent ($ktCO_2e$). As shown in Figure 3.4 on page 101, CSIRO's energy consumption (electricity and gas) and emissions have remained relatively constant over the past five years. In 2012–13, CSIRO's electricity consumption decreased by two per cent compared to the previous year, despite increases at several sites due to impacts such as energy-intensive projects (e.g. Pullenvale). During the same period, CSIRO's gas consumption decreased by five per cent. More than 30 CSIRO sites recorded reductions in energy consumption, including Black Mountain, Newcastle, Waite, Floreat and Werribee. Energy reductions were also achieved through relocation of staff into new facilities (e.g. North Ryde, NSW and Belmont, Victoria).

Over the last five years, energy consumption per staff member has averaged 116 Gigajoules (GJ)/full-time equivalent (FTE) (see Table 3.2 on page 101). CSIRO is continuing to explore opportunities to reduce energy per staff member. CSIRO air travel was approximately 116 million air kilometres in 2012–13 or 20,214 air kilometres per staff member, equating to a one per cent increase compared to 2011–12. CSIRO remains committed to reducing its air travel through increased use of video-conferencing facilities and webcams.

More than 200 kilowatt (kW) of solar photovoltaic (PV) cells was installed at CSIRO's Kensington site in Western Australia. Half of the PV was installed onto the Pawsey Centre, which supports the geoscience and nanoscience communities and the Australian Square Kilometre Array Pathfinder radio telescope. The PV cells will generate enough electricity to offset the energy used by pumps in the geothermal air conditioning system, resulting in an energy-neutral cooling solution. (See: **www.ivec.org/ivec-projects/pawsey/environment**). An additional 100 kW was installed onto adjacent buildings at the Australian Resources Research Centre.

Completion of a Sustainable Properties Manual will guide the planning, design and commissioning of new sites, buildings and research facilities, as well as their operation and maintenance. CSIRO's role in the development of Australia's five global research precincts will provide the opportunity to integrate sustainability requirements into the design of new facilities at CSIRO's Black Mountain (Canberra) and Clayton (Melbourne) precinct sites.

TABLE 3.1: EXAMPLES OF CSIRO'S CONTRIBUTION TO ESD PRINCIPLES

Principles	CSIRO's activities
Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.	Energymark is a household energy efficiency program developed and tested by CSIRO, which uses peer-to-peer networks to achieve behaviour change. Energymark was trialled in New South Wales and in the Brisbane and Redlands City Council areas, where participants recorded average energy savings of between 12–23 per cent over the duration of the 8–12 month program.
If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	Research undertaken by the South Eastern Australian Climate Initiative (SEACI) determined how climate change and variability are affecting rainfall and runoff in south-eastern Australia, its impact, and anticipated future outcomes, which will improve current management of water resources. SEACI is a partnership between CSIRO, the Bureau of Meteorology, the Australian Government Department of Climate Change and Energy Efficiency, the Murray-Darling Basin Authority and the Victorian Department of Sustainability and Environment.
The principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The Pawsey Centre, built, commissioned and operated by CSIRO on behalf of the Interactive Virtual Environments Centre (iVEC), is gaining an extensive international profile for its use of groundwater cooling for the supercomputer – one of a few such facilities in the world. The cooling solution is designed to reduce energy and water consumption associated with the operation of state-of-the art ICT facility. The process involves pumping water with an ambient temperature of around 21°C from the Mullaloo aquifer through an above-ground heat exchanger to provide the necessary cooling effect for the supercomputer, then reinjects the water back into the aquifer. Potentially detrimental hotspots are avoided by moving the discharge point. The system is estimated to save approximately 38 megalitres of cooling water per annum when compared with a conventional cooling system.
The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.	FishMap is a free online mapping tool that allows the identification of fish species at any location or depth throughout the marine waters of Australia's continental shelf and slope. The tool was developed by CSIRO's Wealth from Oceans Flagship and the *Atlas of Living Australia* and assists the management and sustainability of Australia's marine biodiversity. FishMap has myriad uses, including plotting the range of threatened species, or identifying fish spotted during a dive, to plotting the range of a threatened species, or improving quality of data collected by citizen scientists, field workers and scientists, or determining the possible species composition for catches of any fishery in the waters of Australia's continental shelf and slope. Further details can be found at: **www.csiro.au/Portals/Media/So-many-fish-one-great-map.aspx**
Improved valuation, pricing and incentive mechanisms should be promoted.	CSIRO, in partnership with its collaborators, has a number of research programs aimed at improving the utilisation and cost-competiveness of low-emission and renewable energy technologies. For example, CSIRO, six Australian universities and three international universities formed the Australian Solar Thermal Research Initiative, to support long-term research programs that aim to transform Australia into a global leader in concentrated solar power technologies. The goal is to lower the cost of solar thermal power to 12 cents a kilowatt-hour by 2020 (more on page 29). CSIRO's Future Manufacturing Flagship is addressing the high cost of silicon solar cells and their complex production process by developing alternative solar cell technologies using organic photovoltaics (OPVs). OPVs have the potential to lower the cost of environmentally friendly production methods, the ability to mass produce and will result in a marked change in how and where energy can be generated.

WASTE

CSIRO engaged a new service provider, SITA Australia, to provide organisation-wide commercial and industrial waste and recycling services, including the provision of hazardous waste collections. Up to 25 waste and recycling streams (types of recyclable material recovered/diverted from landfill) will be handled. For the first time, CSIRO will also be provided with a comprehensive site, state/territory and national waste profile including tonnes of CO_2e avoided, cubic metres of landfill saved, and clearly identified areas for improvements.

The Recycling Station Office Program (waste/mixed recycling/organics) was rolled out across 33 sites where CSIRO has carriage of the waste and management services. The expanded national external collection service will spearhead resource recovery targets and generate significant savings over the next five years.

In July 2012, CSIRO was proud to become a signatory to FluoroCycle, a voluntary program that seeks commitments from organisations to divert all mercury-containing lighting (for example, fluorescent tubes) for disposal from landfill and into resource recovery.

WATER

CSIRO's water consumption reduced from 406 megalitres in 2008–09 to 368 megalitres in 2012–13, although there was an increase of two megalitres in 2012–13 compared with the previous year. However, a downward trend is shown over the long-term, with a reduction of 12 per cent over the past five years (see Figure 3.4). Water reductions have been achieved through general conservation measures and use of rainwater and recycled water for applications such as irrigation. CSIRO is also investigating other opportunities to use recycled or rainwater. Table 3.2 shows that water consumption per staff member decreased from 69 kL/FTE in 2008–09 to 64 kL/FTE in 2012–13, a reduction of seven per cent over that period.

The Sustainable Properties Manual includes a water reuse and recycling guide for the safe and sustainable use of non-mains water sources, for example, rain, waste water from mechanical devices, water purification systems and laboratory equipment at CSIRO sites. As part of the manual development, CSIRO is investigating new end uses for harvested water that will be crucial to achieving its water reduction targets.

STAFF ENGAGEMENT

During 2012–13, key staff engagement initiatives supported the Recycling Station Office Program, with focus on altering behaviour to reduce waste generation, increase recycling and minimise contamination. The initiatives included the involvement of tenants who contribute to waste targets on CSIRO sites. Other waste-related initiatives included a trial to investigate the diversion of laboratory waste from landfill and a Business Clean Up Week in June 2013 which focused on e-waste (electronic).

The C-Green Program, which is made up of a network of volunteers from all staff levels and roles has expanded from 50 to 147 staff, an increase of 190 per cent. The Program plays a key role in ESS-driven initiatives, such as trials for laboratory oven timers, recycled toilet paper and paper towels, re-usable cafeteria coffee mugs, joint promotions with local government to reduce bottled water consumption, converting from hard copy to digital subscriptions, vegetable and native plant landscaping, and fridge/freezer energy management. CSIRO is also a supporter of Earth Hour, an international energy reduction awareness event.

C-Greens at CSIRO's Marsfield site constructing a native plant garden which reduces the heat generated from the adjacent metal wall of a building and minimises the energy required for air conditioning to keep the building cool.

Figure 3.4: CSIRO energy and greenhouse gas emissions (electricity and gas only) and water consumption

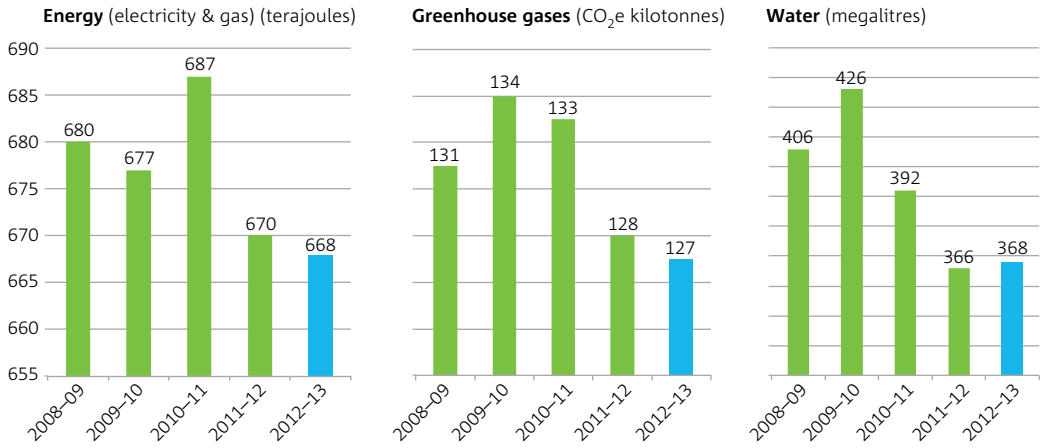


TABLE 3.2: CSIRO'S ENERGY, AIR TRAVEL AND WATER INTENSITIES

Theme	Performance measure	Indicator(s)	2008–09	2009–10	2010–11	2011–12	2012–13[52]
Energy	Relative energy uses	Green energy purchased divided by the amount of electricity purchased	13%	17%	18%	19%	17.5%
		Amount of energy (electricity and gas) consumed per employee (GJ)/FTE[53]	116	114	119	117	116
Air travel	Air travel	Air travel (million kilometres)	Not available	82	116	114	116
		Air travel per employee (km/FTE)	Not available	13,768	20,069	19,930	20,214
Water	Relative mains water use	Amount of total water use per employee (kilolitres (kilolitres)/FTE)	69	72	68	64	64

52 Data as July 2013

53 FTE refers to CSIRO Officers as at June 2013

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 that our people need to work collaboratively and creatively.

CSIRO's Human Resources (HR) Plan underpins our commitment to developing and supporting our staff, with the HR function providing support and leadership on people issues to leaders and staff across CSIRO. During 2012–13 we focused on the following goals from our HR strategy:

- Values and Innovation Culture
  - Diversity and inclusion
  - Change management
  - Improving service delivery and quality, especially in recruitment and our service centre
  - Embedding our Values and Code of Conduct
  - Complex case management
- Learning and Development
  - Curriculum development
  - Building an enterprise Learning Management System
- Capability Planning
  - Strategic workforce planning
  - Indigenous employment
  - Role and accountability statements and capability profiles

We also continue to provide quality services to the Organisation across the full range of HR services including:

- Workplace relations and enterprise agreements
- Recruitment
- Policy, payroll, superannuation, records
- Performance management
- Rewards and awards
- Change management
- Career management
- Orientation
- Leadership succession

ENTERPRISE AGREEMENTS

Enterprise agreements set the terms and conditions of employment for CSIRO staff. Two enterprise agreements are in operation at CSIRO – CSIRO Enterprise Agreement 2011–14 (CSIRO EA) and the Canberra Deep Space Communication Complex (CDSCC) / Combined Unions Enterprise Agreement 2011 (CDSCC EA). The CSIRO EA 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. The CDSCC EA covers non-managerial CSIRO staff employed at CDSCC, Tidbinbilla, Canberra, and came into operation on 8 July 2011 and will reach its nominal expiry date in July 2013. Preliminary planning and preparations for the development of the next CSIRO Agreement has commenced, with further work to be progressed during the 2013–14 financial year. The CDSCC Agreement is currently being negotiated.

COMCARE IMPROVEMENT NOTICE

In response to a Comcare Improvement Notice issued to CSIRO in July 2012, CSIRO introduced new psychosocial and health risk assessment requirements. We introduced mandatory reporting for bullying and harassment, and developed mandatory training on the prevention of workplace bullying and harassment using a custom developed eLearning module and face-to-face training. In March 2013 Comcare confirmed that CSIRO had fully complied with the Improvement Notice.

LEARNING AND DEVELOPMENT

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.

This year has seen significant growth for Learning and Development at CSIRO, delivering enterprise-wide learning solutions that support the delivery of excellent science. Ten new programs have been introduced and two have been updated. In line with global best practice, we continue to incorporate a 'blended learning' approach (classroom methods with technology-enabled activities) in our programs.

DIVERSITY AND INCLUSION

Diversity and inclusion has been an enterprise-wide focus during 2012–13 as implementation of the 2012–15 Diversity and Inclusion Plan progresses. 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 the reporting period include:

- Formation of the Chief Executive-led Diversity and Inclusion Steering Committee, and addition of diversity and inclusion to requirements for Group annual progress reporting to the Chief Executive.
- Seven Divisions are now covered by diversity and inclusion committees or reference groups.
- All Group Human Resource Managers now have diversity and inclusion as one of their top four priority areas.
- An increase in requests from senior leaders for interaction and support from HR and diversity and inclusion teams.

CSIRO's Indigenous Engagement Strategy, which aims to achieve greater Indigenous participation in CSIRO's research and development agenda and activities, continues to be progressed (more on page 13). The Indigenous Employment Strategy aims to increase the employment of Indigenous peoples through the implementation of several new employment programs and targeted approaches. CSIRO's commitment is reflected in the CSIRO Enterprise Agreement.

INNOVATION MATURITY MODEL

As a key contribution to the 2011–15 Strategic Plan goal of 'building an enhanced culture of innovation', CSIRO researched and developed an Innovation Maturity Model (IMM). The model specifies the elements (21 defined) essential for organisational innovation at five levels of maturity. By applying the findings of the 'Working in CSIRO' survey to the model, CSIRO was able to robustly measure and baseline its capacity to innovate and benchmark against other organisations. During 2012–13, the IMM's relevance and utility has continued. It has proved a useful framework to coherently discuss and set cultural/operational direction, plan change activity, and measure and report progress.

STAFF DEMOGRAPHICS

CSIRO staff are employed under section 32 of the *Science and Industry Research Act 1949*. At 30 June 2013, CSIRO had a total of 6,477 staff, which has a full-time equivalent (FTE) of 5,751.

Table 3.3 shows the number of staff employed in different functional areas and Table 3.4 on page 104 shows staff by state. Overall, the total number of staff decreased by 0.2 per cent (15) over the last 12 months. Research Science staff decreased by 4.6 per cent (90). Voluntary staff turnover remained at a very low level of 4.3 per cent. The proportion of female staff in CSIRO stayed constant at 40 per cent and the proportion of female Research Scientists dipped marginally from 25 to 24.4 per cent (up from 22.6 per cent in 2008–09).

TABLE 3.3: STAFF NUMBERS (HEADCOUNT) AS AT 30 JUNE

Functional Area	2008–09	2009–10	2010–11	2011–12	2012–13	% Female for 2012–13
Research Scientists	1,837	1,907	1,865	1,948	1,858	24
Research Project Staff	2,215	2,241	2,166	2,094	2,149	43
Senior Specialists	13	15	12	11	25	36
Research Management	176	161	165	166	177	11
Research Consulting	26	34	40	42	47	17
Technical Services	545	630	643	613	623	12
Communication and Information Services	407	429	375	391	369	67
General Services	51	48	56	40	38	55
Administrative Support*	1,112	1,075	1,048	1,057	1,068	76
General Management	128	140	144	130	123	25
Total headcount	**6,510**	**6,680**	**6,514**	**6,492**	**6,477**	**40**
FTE	**5,866**	**5,956**	**5,780**	**5,720**	**5,751**	**37**

*Administrative Support includes: Staff who provide science-based administrative and management services and systems.

TABLE 3.4: STAFF NUMBERS (HEADCOUNT) BY STATE AS AT 30 JUNE 2013

State	Metropolitan	Regional	Total
ACT	1,386	-	1,386
NSW	783	324	1,107
NT	25	12	37
QLD	744	135	879
SA	388	-	388
TAS	391	-	391
VIC	1,446	332	1,778
WA	501	10	511
Grand Total	**5,664**	**813**	**6,477**

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 2012–13 that demonstrate our effectiveness in research and its application in industry and the community.

ORDER OF AUSTRALIA

MEMBER (AM)

> **Dr David Rentz**
(formerly Ecosystems Sciences) for significant service to science, particularly in the field of entomology, and to the community.

> **Mr Richard Eckersley**
(formerly CSIRO Media) for significant service to the community as a researcher, analyst and commentator on population health and wellbeing in Australia.

AUSTRALIAN MUSEUM EUREKA PRIZES 2012

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.

> **Dr Matthew Hill**
(Materials, Science and Engineering) was named the Emerging Leader in Science for his research into a type of ultra-porous materials known as Metal Organic Frameworks – materials that can provide cleaner energy and lower human impact on the environment.

> **Dr Yonggang Zhu**
(Materials, Science and Engineering) was awarded the Defence Science and Technology Organisation award for Outstanding Science in Support of Defence or National Security. Dr Zhu was recognised for his 'lab on a chip' work that has led to the creation of an ultra-fast chemical agent detector – a portable plastic microchip sensor that can quickly detect toxic chemical substances.

THE SIR IAN CLUNIES ROSS AWARD

> **Dr Paul Wood**
(formerly Animal Health) was awarded the Australian Academy of Technological Sciences and Engineering Clunies Ross Award for fundamentally changing the way tuberculosis is detected and treated in developing countries.

THE ROYAL MEDAL

> **Dr Andrew Holmes**
(CSIRO Fellow) was awarded the 2012 Royal Medal from the Royal Society London. Three Royal Medals are awarded annually for the most important contributions in the physical, biological and applied or interdisciplinary sciences.

Dr Holmes received the award for his contributions at the interface of the materials and biological sciences that will lead to outcomes that will benefit society. He played a pioneering role in the field of applied organic electronic materials.

Winners of the Chairman's Medal: the Ngara Backhaul Project Team (left to right):

- Dr Eileen Doyle (CSIRO Board member)
- Dr Megan Clark (Chief Executive, CSIRO)
- Dr Xiaojing Huang
- Mr Val Dyadyuk
- Dr Andrew Zhang
- Mr Nipun Bhaskar
- Dr Jay Guo
- Dr John Bunton
- Mr Mark De Alwis
- Mr Alex Grancea
- Mr Ivan Kekic
- Ms Jayasri Joseph
- Mr Chris Lewis
- Mr John Matthews
- Mr Keith Bengston
- Mr Carl Holmesby
- Mr Joseph Pathikulangara

CSIRO CHAIRMAN'S MEDAL

The Chairman's Medal honours the most exceptional research in CSIRO and is awarded to the scientist or team whose research is of national or international importance in advancing scientific knowledge, technology application or commercialisation.

The winners of the *2012 Chairman's Medal* were Dr Xiaojing Huang (team leader) and the Ngara Backhaul Project Team. The team received the award in recognition of their outstanding achievement of developing the world's fastest ten gigabit per second microwave link. This innovation has the potential to bridge the city-country gap and significantly improve broadband services in rural and regional Australia.

Further information on CSIRO Awards can be found at: **www.csiro.au/CSIROChairmansMedal**

THE CSIRO MEDAL FOR LIFETIME ACHIEVEMENT

This Medal is awarded to individuals who have a record of sustained and meritorious achievement over a prolonged period of CSIRO service. In 2012, two CSIRO Medals for Lifetime Achievement were awarded.

- **Dr Richard Head** (Preventative Health Flagship) was recognised for being at the forefront of the National Research Flagships Program – one of the most significant changes in CSIRO's history. Dr Head also established the Preventative Health Flagship that led the stimulus for a preventative approach to human health at a national level.

- **Mr Terry Healy** (CSIRO Legal) was recognised for the formation and leadership of CSIRO's Legal function, providing highly respected legal and policy advice, mentoring colleagues, managing CSIRO's landmark wireless local area network intellectual property litigation, and contribution to Australian innovation.

AEROGARD

The insect repellent developed by CSIRO scientists for troops in the Pacific is now an Australian icon synonymous with summer.

PART FOUR
FINANCIAL STATEMENTS

Australian National Audit Office

INDEPENDENT AUDITOR'S REPORT

To the Minister for Innovation, Industry, Science and Research

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 2013, which comprise: the Statement by the Chairman of the Board, Chief Executive and Chief Finance Officer; the Statement of Comprehensive Income; Balance Sheet; Statement of Changes in Equity; Cash Flow Statement; Schedules of Commitment; Schedule 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 the 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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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 financial positions as at 30 June 2013 and of their financial performance and cash flows for the year then ended.

Australian National Audit Office

Puspa Dash

Puspa Dash
Executive Director

Delegate of the Auditor General

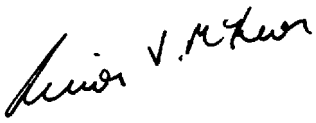
Canberra
22 August 2013

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 2013 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.

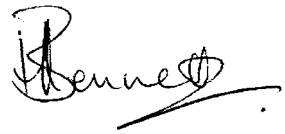


Simon McKeon AO
Chairman of the Board

22 August 2013

Megan Clark
Chief Executive and Board Member

22 August 2013



Hazel Bennett
Chief Finance Officer

22 August 2013

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF COMPREHENSIVE INCOME
For the period ended 30 June 2013

	Notes	Consolidated		CSIRO	
		2013	2012	**2013**	2012
		$'000	$'000	**$'000**	$'000
EXPENSES					
Employee benefits	3.1	**732,035**	739,908	**731,918**	738,477
Supplier expenses	3.2	**415,652**	397,358	**401,905**	395,722
Depreciation and amortisation	3.3	**122,906**	118,684	**122,906**	118,684
Finance costs	3.4	**2,865**	3,271	**2,864**	3,271
Write-down and impairment of assets	3.5	**7,057**	19,357	**7,057**	19,357
Losses from asset sales	3.6	**874**	-	**874**	-
Total expenses		**1,281,389**	1,278,578	**1,267,524**	1,275,511
LESS:					
OWN-SOURCE INCOME					
Own-source revenue					
Sale of goods and rendering of services	4.1	**413,356**	398,784	**425,162**	410,818
Interest	4.2	**18,070**	17,890	**11,529**	9,195
Rental income		**7,176**	8,253	**7,176**	8,253
Royalties and licence fees	4.3	**37,548**	278,516	**37,548**	278,516
Other revenues	4.4	**24,882**	38,215	**25,353**	38,714
Total own-source revenue		**501,032**	741,658	**506,768**	745,496
Gains					
Net gain from sale of assets	4.5	**-**	409	**-**	409
Net foreign exchange gains	4.6	**5,454**	5,127	**5,454**	5,127
Total gains		**5,454**	5,536	**5,454**	5,536
Total own-source income		**506,486**	747,194	**512,222**	751,032
Net cost of services		**(774,903)**	(531,384)	**(755,302)**	(524,479)
Revenue from Government	4.7	**733,817**	724,939	**733,817**	724,939
Share of net operating surplus/(deficit) of joint venture accounted for using equity method	8	**(53)**	10	**(53)**	10
Surplus on continuing operation		**733,764**	**724,949**	**733,764**	**724,949**
Surplus/(Deficit) attributable to the Australian Government		**(41,139)**	193,565	**(21,538)**	200,470
OTHER COMPREHENSIVE INCOME					
Increase/(decrease) in asset revaluation reserves	5.1	**(1,102)**	1,414	**(1,102)**	1,414
Increase/(decrease) in other reserves	5.2	**(1,004)**	(140)	**(1,004)**	(140)
Total comprehensive income		**(2,106)**	1,274	**(2,106)**	1,274
Total comprehensive income/(loss) attributable to the Australian Government		**(43,245)**	194,839	**(23,644)**	201,744

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
BALANCE SHEET
As at 30 June 2013

	Notes	Consolidated		CSIRO	
		2013	2012	**2013**	2012
		$'000	$'000	**$'000**	$'000
ASSETS					
Financial Assets					
Cash and cash equivalents	6	**404,638**	381,687	**283,013**	240,976
Trade and other receivables	7	**170,199**	247,884	**169,841**	247,692
Investments accounted for using the equity method	8	**346**	399	**346**	399
Other Investments	9	**10,520**	17,142	**10,520**	17,142
Total financial assets		**585,703**	647,112	**463,720**	506,209
Non-Financial Assets					
Land and buildings	10	**1,567,086**	1,581,745	**1,567,086**	1,581,745
Plant and equipment	11	**518,426**	446,851	**518,426**	446,851
Intangibles	12	**25,135**	28,711	**25,135**	28,711
Investment properties	13	**52,150**	52,000	**52,150**	52,000
Inventories	14	**1,162**	1,163	**1,162**	1,163
Other non-financial assets	15	**53,107**	42,096	**53,107**	42,094
Total non-financial assets		**2,217,066**	2,152,566	**2,217,066**	2,152,564
Properties held for sale	16	**8,583**	14,319	**8,583**	14,319
TOTAL ASSETS		**2,811,352**	2,813,997	**2,689,369**	2,673,092
LIABILITIES					
Payables					
Suppliers	17	**62,433**	72,152	**61,779**	70,438
Other payables	18	**200,347**	171,065	**199,938**	172,395
Total payables		**262,780**	243,217	**261,717**	242,833
Interest Bearing Liabilities					
Leases	19	**57,243**	61,033	**57,243**	61,033
Deposits	20	**6,337**	7,130	**6,337**	7,130
Total Interest bearing liabilities		**63,580**	68,163	**63,580**	68,163
Provisions					
Employee provisions	21	**248,053**	246,854	**248,053**	246,854
Total provisions		**248,053**	246,854	**248,053**	246,854
TOTAL LIABILITIES		**574,413**	558,234	**573,350**	557,850
NET ASSETS		**2,236,939**	2,255,763	**2,116,019**	2,115,242
EQUITY					
Contributed equity		**259,220**	149,588	**259,020**	149,388
Asset revaluation reserves		**1,321,527**	1,322,629	**1,321,527**	1,322,629
Other reserves		**(369)**	635	**(369)**	635
Retained surplus		**656,561**	782,911	**535,841**	642,590
TOTAL EQUITY		**2,236,939**	2,255,763	**2,116,019**	2,115,242

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 2013

	Retained earnings		Asset revaluation reserve		Other reserves		Contributed equity/capital		Total equity	
	2013	2012	**2013**	2012	**2013**	2012	**2013**	2012	**2013**	2012
	$'000	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000
Opening balance	**782,911**	589,346	**1,322,629**	1,321,215	**635**	775	**149,588**	116,690	**2,255,763**	2,028,026
Comprehensive income										
Other comprehensive income	**-**	-	**(1,102)**	1,414	**(1,004)**	(140)	**-**	-	**(2,106)**	1,274
Surplus/(deficit) for the period	**(41,139)**	193,565	**-**	-	**-**	-	**-**	-	**(41,139)**	193,565
Total comprehensive income	**(41,139)**	193,565	**(1,102)**	1,414	**(1,004)**	(140)	**-**	-	**(43,245)**	194,839
Transactions with owners										
Contributions by owners										
Equity injection	**-**	-	**-**	-	**-**	-	**109,632**	32,898	**109,632**	32,898
Payment to the Commonwealth	**(85,211)**	-	**-**	-	**-**	-	**-**	-	**(85,211)**	-
Closing balance	**656,561**	782,911	**1,321,527**	1,322,629	**(369)**	635	**259,220**	149,588	**2,236,939**	2,255,763

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF CHANGES IN EQUITY – CSIRO
For the period ended 30 June 2013

	Retained earnings		Asset revaluation reserve		Other reserves		Contributed equity/capital		Total equity	
	2013	2012	**2013**	2012	**2013**	2012	**2013**	2012	**2013**	2012
	$'000	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000
Opening balance	**642,590**	442,120	**1,322,629**	1,321,215	**635**	775	**149,388**	116,490	**2,115,242**	1,880,600
Comprehensive income										
Other comprehensive income	**-**	-	**(1,102)**	1,414	**(1,004)**	(140)	**-**	-	**(2,106)**	1,274
Surplus/(deficit) for the period	**(21,538)**	200,470	**-**	-	**-**	-	**-**	-	**(21,538)**	200,470
Total comprehensive income	**(21,538)**	200,470	**(1,102)**	1,414	**(1,004)**	(140)	**-**	-	**(23,644)**	201,744
Transactions with owners										
Contributions by owners										
Equity injection	**-**	-	**-**	-	**-**	-	**109,632**	32,898	**109,632**	32,898
Payment to the Commonwealth	**(85,211)**	-	**-**	-	**-**	-	**-**	-	**(85,211)**	-
Closing balance	**535,841**	642,590	**1,321,527**	1,322,629	**(369)**	635	**259,020**	149,388	**2,116,019**	2,115,242

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
CASH FLOW STATEMENT
For the period ended 30 June 2013

	Notes	Consolidated		CSIRO	
		2013	2012	**2013**	2012
		$'000	$'000	**$'000**	$'000
OPERATING ACTIVITIES					
Cash received					
Receipts from Government		**733,817**	724,939	**733,817**	724,939
Goods and services		**573,773**	617,498	**585,305**	627,151
Interest		**18,320**	15,865	**11,640**	7,965
Net GST received		**7,777**	1,659	**6,244**	810
Deposits		**4,274**	9,104	**4,274**	9,104
Total cash received		**1,337,961**	1,369,065	**1,341,280**	1,369,969
Cash used					
Employees		**718,674**	692,436	**718,287**	692,203
Suppliers		**475,294**	454,800	**460,034**	449,660
Finance costs		**2,695**	3,093	**2,695**	3,093
Total cash used		**1,196,663**	1,150,329	**1,181,016**	1,144,956
Net cash from operating activities	22	**141,298**	218,736	**160,264**	225,013
INVESTING ACTIVITIES					
Cash received					
Proceeds from sale of property, plant and equipment		**9,026**	12,543	**9,026**	12,543
Proceeds from sale of equity investments and intellectual property		**138**	30	**138**	30
Total cash received		**9,164**	12,573	**9,164**	12,573
Cash used					
Purchase of property, plant and equipment		**175,071**	183,465	**174,951**	183,465
Equity investments		**1,242**	3,264	**1,242**	3,264
Other selling costs		**119**	102	**119**	102
Total cash used		**176,432**	186,831	**176,312**	186,831
Net cash from (used by) investing activities		**(167,268)**	(174,258)	**(167,148)**	(174,258)
FINANCING ACTIVITIES					
Cash received					
Contributed equity		**109,632**	32,898	**109,632**	32,898
Total cash received		**109,632**	32,898	**109,632**	32,898
Cash used					
Payment to the Commonwealth		**56,921**	-	**56,921**	-
Other cash used		**3,790**	4,167	**3,790**	4,167
Total cash used		**60,711**	4,167	**60,711**	4,167
Net cash from financing activities		**48,921**	28,731	**48,921**	28,731
Net increase/(decrease) in cash held		**22,951**	73,209	**42,037**	79,486
Cash and cash equivalents at the beginning of the reporting period		**381,687**	308,478	**240,976**	161,490
Cash and cash equivalents at the end of the reporting period	6	**404,638**	381,687	**283,013**	240,976

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
SCHEDULE OF COMMITMENTS
As at 30 June 2013

	Consolidated		CSIRO	
	2013	2012	**2013**	2012
BY TYPE	**$'000**	$'000	**$'000**	$'000
Commitments receivable				
Research and development commitments[1]	**(396,683)**	(397,541)	**(396,683)**	(397,541)
Other receivables[2]	**(38,583)**	(16,098)	**(38,583)**	(16,098)
GST receivable	**(62,519)**	(57,308)	**(58,917)**	(56,206)
Total commitments receivable	**(497,785)**	(470,947)	**(494,183)**	(469,845)
Capital commitments payable				
Land and buildings[3]	**17,133**	13,970	**17,133**	13,970
Plant and equipment[4]	**42,054**	65,433	**42,054**	65,433
Investments[5]	**2,692**	2,834	**2,692**	2,834
Total capital commitments payable	**61,879**	82,237	**61,879**	82,237
Other commitments payable				
Operating leases[6]	**241,630**	268,367	**241,630**	268,367
Research and development commitments[1]	**727,297**	668,694	**687,675**	656,581
Other commitments[2]	**94,858**	27,560	**94,858**	27,560
Total other commitments payable	**1,063,785**	964,621	**1,024,163**	952,508
Net commitments by type	**627,879**	575,911	**591,859**	564,900
BY MATURITY				
Commitments receivable				
One year or less	**(239,382)**	(300,458)	**(238,358)**	(300,087)
From one to five years	**(232,039)**	(159,623)	**(229,476)**	(158,892)
Over five years	**(26,364)**	(10,866)	**(26,349)**	(10,866)
Total commitments receivable	**(497,785)**	(470,947)	**(494,183)**	(469,845)
Commitments payable				
Capital commitments payable				
One year or less	**52,229**	80,594	**52,229**	80,594
From one to five years	**9,650**	1,643	**9,650**	1,643
Total capital commitments payable	**61,879**	82,237	**61,879**	82,237
Operating lease commitments payable				
One year or less	**33,437**	33,981	**33,437**	33,981
From one to five years	**131,004**	131,641	**131,004**	131,641
Over five years	**77,189**	102,745	**77,189**	102,745
Total operating lease commitments payable	**241,630**	268,367	**241,630**	268,367
Other commitments payable				
One year or less	**389,880**	464,393	**378,619**	460,315
From one to five years	**421,823**	229,485	**393,628**	221,450
Over five years	**10,452**	2,376	**10,286**	2,376
Total other commitments payable	**822,155**	696,254	**782,533**	684,141
Net commitments by maturity	**627,879**	575,911	**591,859**	564,900

The above Statement should be read in conjunction with the accompanying notes.

SCHEDULE OF COMMITMENTS (cont)

1. Research and development commitments payable and receivable are Agreements Equally Proportionately Unperformed for research and development contracts.
2. Other commitments payable and receivable are for services and property leases respectively.
3. Land and building commitments are outstanding contractual payments for buildings under construction.
4. Plant and equipment commitments are for the purchase of plant and equipment.
5. Investment commitments are for additional contributions to equity investments.
6. 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, following a once-off adjustment of rentals to current market levels.
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.

Note: Commitments are GST inclusive where relevant.

SCHEDULE OF CONTINGENCIES
As at 30 June 2013

	Consolidated		CSIRO	
	2013	2012	**2013**	2012
	$'000	$'000	**$'000**	$'000
Contingent assets				
Claims for damages or costs and bank guarantees	**1,337**	7,660	**1,337**	7,660
Total contingent assets	**1,337**	7,660	**1,337**	7,660
Contingent liabilities				
Claims for damages or costs	**400**	300	**400**	300
Financial guarantees	**45**	45	**45**	45
Total contingent liabilities	**445**	345	**445**	345
Net contingent assets/(liabilities)	**892**	7,315	**892**	7,315

Details of each class of contingent liabilities and contingent assets listed above are disclosed in Note 23: 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 2013

CONSOLIDATED FINANCIAL STATEMENTS
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS
For the year ended 30 June 2013

Note 1: Summary of the significant accounting policies

1.1 Objective of the Organisation 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 and Science and Industry Endowment Fund (SIEF) - 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.

The Commonwealth Scientific and Industrial Research Organisation 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 Balance Sheet when, and only when, it is probable that future economic benefits will be required and the amounts of the assets or liabilities can be reliably measured. However, assets and liabilities arising under Agreements Equally Proportionately Unperformed 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' and 'investment properties' has been taken to be the market value 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 'existing use value' and 'depreciated replacement cost' respectively, as determined by an independent valuer and CSIRO's registered valuer;
- The fair value of plant and equipment has been taken to be the 'depreciated replacement cost' as determined by an independent valuer;
- The fair value of investments in unlisted companies is based on the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation Guidelines'; and
- 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.

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.

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 2013 and the results of the controlled entities for the year then ended.

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
- 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 15), being the gross unbilled amount expected to be collected from clients for contract research and services performed as at 30 June 2013, or contract research revenue received in advance (Note 18), 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 as at the end of reporting period. 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 is recognised on an accrual basis in accordance with the substance of the relevant licensing agreements.

Revenues from Government
Funding received from the Australian Government Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (appropriated to CSIRO as a CAC Act body payment item) is recognised as Revenue from Government unless they are 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 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.

Resources received free of charge are recorded as either revenue or gains depending on their nature.

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 2013 for long service leave has been determined by the short hand method and reference to the work of the Australian Government Actuary (AGA). The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Separation and Redundancy

Provision is made for separation and redundancy benefit payments. CSIRO recognises a provision for termination when it has developed a detailed formal plan for the terminations and has informed those employees affected that it will carry out the terminations.

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 and Deregulation 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 2013 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 Guidelines (AVCAL)'.

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 AVCAL 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 balance sheet 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.

1.17 Property, Plant and Equipment

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the Balance Sheet, 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/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 'existing use value'. Existing use contemplates the continued use of the asset for the same application as at the date of valuation;
- Buildings and leasehold improvements, which will continue to be used for research activities, are valued by CSIRO's registered valuer at their depreciated replacement cost using current building prices to arrive at current gross replacement cost less accumulated depreciation having regard to the age, condition and suitability for research and development activities. 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 lesser of the depreciated replacement or reproduction cost;
- Properties held or identified for sale and investment properties are valued by independent valuers as at reporting date; and
- 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 25.

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:

	2013	2012
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

Impairment

All assets were assessed for impairment at 30 June 2013. 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.

1.18 Intangibles

Intangibles comprise 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 the $250,000 threshold and expensed in the year of acquisition.

Software is amortised on a straight-line basis over its anticipated useful life. The useful lives of software are 2 to 10 years (2012: 2 to 10 years).

All software assets were assessed for indications of impairment as at 30 June 2013.

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 balance sheet date. Gains or losses arising from changes in the fair values of investment properties are recognised in the profit or loss 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 profit or loss 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. CSIRO have paid and will pay a further 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 will be applied to the conduct of scientific research activities within precincts to be funded under the Government's Industry and Innovation Statement. Payments to the Commonwealth have been made and will be made as cash proceeds are received.

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 Organisation 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 Science and Industry Endowment Fund is exempt from income tax in Australia. WLAN Services Pty Ltd is subject to all applicable taxes in Australia.

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 is a participant in 20 CRCs and the names of these CRCs are disclosed in Note 24.

Joint Venture Entities – Unincorporated

Murray-Darling Freshwater Research Centre (MDFRC) – CSIRO's 33.3% interest in the MDFRC is accounted for using the equity method. Refer to Note 8 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 Balance Sheet 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.

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 7 – Trade and other receivables, Note 17 – Trade creditors and accruals; and Note 35 – Reporting of outcome, reflect business transactions between the Group and other FMA and CAC Act agencies and any subsidiaries.

Note 2: Events after the balance sheet date

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	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
3.1 Employee Benefits					
Wages and salaries		**552,725**	538,705	**552,618**	537,285
Superannuation - defined contribution plans		**90,785**	83,940	**90,775**	83,929
Leave and other entitlements		**80,699**	118,047	**80,699**	118,047
Separation and redundancies		**20,189**	9,418	**20,189**	9,418
Gross employee benefits		**744,398**	750,110	**744,281**	748,679
Less					
Capitalised labour		**(12,354)**	(9,976)	**(12,354)**	(9,976)
Employee cost recovery from subsidiary companies		**(9)**	(226)	**(9)**	(226)
Total employee benefits		**732,035**	739,908	**731,918**	738,477
3.2 Suppliers					
Goods and services					
Goods		**112,670**	135,283	**112,671**	135,283
Services		**288,310**	247,741	**274,564**	246,105
Total goods and services		**400,980**	383,024	**387,235**	381,388
Goods and services are made up of:					
Provision of goods - related entities		**-**	-	**-**	-
Provision of goods - external parties		**112,670**	135,283	**112,671**	135,283
Rendering of services - related entities		**31,106**	31,197	**31,106**	31,197
Rendering of services - external parties		**257,204**	216,544	**243,458**	214,908
Total goods and services		**400,980**	383,024	**387,235**	381,388
Other supplier expenses					
Operating lease rentals:					
Minimum lease payments		**9,812**	12,302	**9,812**	12,302
Workers compensation expenses		**4,860**	2,032	**4,858**	2,032
Total other supplier expenses		**14,672**	14,334	**14,670**	14,334
Total supplier expenses		**415,652**	397,358	**401,905**	395,722
3.3 Depreciation and amortisation					
Depreciation					
Buildings and leasehold improvements		**71,225**	69,413	**71,225**	69,413
Plant and equipment		**47,568**	45,029	**47,568**	45,029
Total depreciation		**118,793**	114,442	**118,793**	114,442
Amortisation					
Intangibles - computer software		**4,113**	4,242	**4,113**	4,242
Total depreciation and amortisation		**122,906**	118,684	**122,906**	118,684
3.4 Finance Costs					
Finance leases		**2,865**	3,271	**2,864**	3,271

Note 3: Expenses (cont)

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
3.5 Write-down and impairment of assets					
Asset write-downs and impairments from:					
Bad debts		**593**	279	**593**	279
Increase/(decrease) in allowance for impairment of receivable		**(693)**	540	**(693)**	540
Impairment of available for sale investments		**6,167**	17,699	**6,167**	17,699
Net impairment loss on revaluation of properties held for sale and investment properties		**650**	578	**650**	578
Net realisation of fair value loss reserve on available for sale investments		**340**	261	**340**	261
Total write-down and impairment of assets		**7,057**	19,357	**7,057**	19,357
3.6 Losses/(Gains) from asset aales					
Equity investment and intellectual property					
Proceeds from sale of intellectual property		**(138)**	-	**(138)**	-
Total proceeds		**(138)**	-	**(138)**	-
Net (gain)/loss from equity investment and intellectual property		**(138)**	-	**(138)**	-
Land and buildings:					
Proceeds from sale		**(4,931)**	-	**(4,931)**	-
Carrying value of assets sold		**5,013**	-	**5,013**	-
Selling expense		**104**	-	**104**	-
Net (gain)/loss from sale of land and buildings		**186**	-	**186**	-
Plant and equipment					
Proceeds from sale		**(505)**	-	**(505)**	-
Carrying value of assets sold		**1,316**	-	**1,316**	-
Selling expense		**15**	-	**15**	-
Net (gain)/loss from sale of plant and equipment		**826**	-	**826**	-
Total losses from asset sales		**874**	-	**874**	-

Note 4: Income

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
4.1 Sale of goods and rendering of services					
Provision of goods - related entities		**-**	-	**-**	-
Provision of goods - external parties		**11,052**	13,165	**11,052**	13,165
Total sale of goods		**11,052**	13,165	**11,052**	13,165
Rendering of services - related entities		**108,452**	112,216	**120,863**	126,189
Rendering of services - external parties		**293,852**	273,403	**293,247**	271,464
Total rendering of services		**402,304**	385,619	**414,110**	397,653
Total sale of goods and rendering of services		**413,356**	398,784	**425,162**	410,818
4.2 Interest					
Bank and term deposits		**18,070**	17,890	**11,529**	9,195
4.3 Royalties and licence fees					
Royalties and licence fees [1]		**37,548**	278,516	**37,548**	278,516
4.4 Other revenues					
Sale of primary produce		**1,721**	1,404	**1,721**	1,404
Donation		**51**	29	**51**	29
Capital contributions		**3,014**	14,301	**3,014**	14,301
Education programs and subscriptions		**3,185**	3,471	**3,185**	3,471
Other		**16,911**	19,010	**17,382**	19,509
Total other revenues		**24,882**	38,215	**25,353**	38,714

[1] Refer Note 1.24.

Note 4: Income (cont)

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
4.5 Net gain/(loss) from sale of assets					
Equity investment and intellectual property					
Proceeds from sale of intellectual property		-	30	-	30
Total proceeds		-	30	-	30
Net gain/(loss) from equity investment and intellectual property		-	30	-	30
Land and buildings					
Proceeds from sale		-	11,102	-	11,102
Carrying value of assets sold		-	(9,751)	-	(9,751)
Selling expenses		-	(89)	-	(89)
Net gain/(loss) from sale of land and buildings		-	1,262	-	1,262
Plant and equipment					
Proceeds from sale		-	594	-	594
Carrying value of assets sold		-	(1,463)	-	(1,463)
Selling expenses		-	(14)	-	(14)
Net gain/(loss) from sale of plant and equipment		-	(883)	-	(883)
Total net gain/(loss) from sale of assets		-	409	-	409
4.6 Foreign exchange gains					
Non-speculative		**5,454**	5,127	**5,454**	5,127
4.7 Revenue from Government					
Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education CAC Act body payment item		**733,817**	724,939	**733,817**	724,939

Note 5: Other comprehensive income

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'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		-	719	-	719
Revaluation of plant and equipment		(1,102)	695	(1,102)	695
Net decrease in asset revaluation reserves		(1,102)	1,414	(1,102)	1,414
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		(1,344)	(401)	(1,344)	(401)
Realisation of fair value loss on sale and impairment of available for sale investment		340	261	340	261
Net increase/(decrease) in other reserve		(1,004)	(140)	(1,004)	(140)

Note 6: Cash and cash equivalents

Cash at bank and on hand	48,417	35,755	45,013	35,713
Term deposits	356,221	345,932	238,000	205,263
Total cash and cash equivalents	404,638	381,687	283,013	240,976

Total cash includes deposits held on behalf of third parties totalling $6.3 million (2012 $7.1 million). Refer Note 20.

Note 7: Trade and other receivables

Good and Services:				
Goods and services - related entities	12,959	13,719	12,959	13,719
Goods and services - external parties	69,153	62,428	69,153	62,428
Total receivables for goods and services	82,112	76,147	82,112	76,147
Other receivables:				
GST receivable from the ATO	3,433	1,103	2,092	771
Interest	3,426	3,376	1,988	1,799
Other receivables	82,062	168,785	84,483	170,502
Total other receivables (gross)	88,921	173,264	88,563	173,072
Total trade and other receivables (gross)	171,033	249,411	170,675	249,219
Less impairment allowance:				
Goods and services	(834)	(1,527)	(834)	(1,527)
Total trade and other receivables (net)	170,199	247,884	169,841	247,692
Receivables are expected to be recovered in:				
No more than 12 months	170,199	178,546	169,841	178,354
More than 12 months	-	69,338	-	69,338
Total trade and other receivables (net)	170,199	247,884	169,841	247,692

Note 7: Trade and other receivables (cont)

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
Receivables are aged as follows:					
Not overdue		**159,928**	238,224	**159,570**	238,032
Overdue by:					
0 to 30 days		**8,181**	7,736	**8,181**	7,736
31 to 60 days		**1,216**	1,647	**1,216**	1,647
61 to 90 days		**281**	311	**281**	311
More than 90 days		**1,427**	1,493	**1,427**	1,493
Total receivables (gross)		**171,033**	249,411	**170,675**	249,219
The impairment allowance account is aged as follows:					
Not overdue		**64**	68	**64**	68
Overdue by:					
0 to 30 days		**-**	27	**-**	27
31 to 60 days		**3**	27	**3**	27
61 to 90 days		**3**	29	**3**	29
More than 90 days		**764**	1,376	**764**	1,376
Total impairment allowance account		**834**	1,527	**834**	1,527

Reconciliation of impairment allowance:	**Consolidated**	**CSIRO**
Movements in relation to 2013	**Goods and services**	**Goods and services**
	$'000	**$'000**
Opening balance	**1,527**	**1,527**
Decrease recognised in net surplus	**(693)**	**(693)**
Closing balance	**834**	**834**
Movements in relation to 2012		
Opening balance	987	987
Increase recognised in net surplus	540	540
Closing balance	1,527	1,527

Note 8: Investments accounted for using the equity method

	Consolidated		CSIRO	
	2013 $'000	2012 $'000	2013 $'000	2012 $'000
Murray-Darling Fresh Water Research Centre	**346**	399	**346**	399

Movements of the carrying amount of investment in the MDFRC joint venture entity are as follows:

Carrying amount at beginning of the financial year	**399**	389	**399**	389
Share of MDFRC's net operating surplus/(deficit) for the year	**21**	3	**21**	3
Adjusted based on audited accounts	**(74)**	7	**(74)**	7
Adjusted share of MDFRC's net operating surplus/(deficit) for the year	**(53)**	10	**(53)**	10
Carrying amount of investment in MDFRC as at 30 June	**346**	399	**346**	399

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% (2012: 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 surplus was $20,705 (2012: $2,300 surplus).

The following is a summary of the financial performance and position of MDFRC:

	Total Revenues $'000	Net Operating Surplus/ (Deficit) $'000	Total Assets $'000	Total Liabilities $'000	Net Assets $'000
2013					
MDFRC (unaudited)	**5,527**	**62**	**3,696**	**2,657**	**1,039**
2012					
MDFRC (audited)[1]	5,128	(214)	3,179	2,202	977

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 2012 balances have been updated to reflect final audited results.

Note 9: Other investments

	Notes	Consolidated		CSIRO	
		2013 $'000	2012 $'000	2013 $'000	2012 $'000
At fair value classified as available for sale investments.	1.14				
Shares (or equity investments)					
Listed companies		**3,195**	5,166	**3,195**	5,166
Unlisted companies		**7,325**	11,676	**7,325**	11,676
Other investment		**-**	300	**-**	300
Total investments		**10,520**	17,142	**10,520**	17,142

All other investments are expected to be recovered in more than 12 months.

Available for sale investments were impaired by $6.167 million (2012: $17.699 million)

Note 10: Land and buildings

	Consolidated		CSIRO	
	2013 $'000	2012 $'000	2013 $'000	2012 $'000
Freehold land - fair value	**378,593**	378,593	**378,593**	378,593
Buildings on freehold land				
- fair value	**1,721,916**	1,683,384	**1,721,916**	1,683,384
- accumulated depreciation	**(982,192)**	(934,376)	**(982,192)**	(934,376)
	739,724	749,008	**739,724**	749,008
- work in progress	**18,083**	25,396	**18,083**	25,396
Total buildings on freehold land	**757,807**	774,404	**757,807**	774,404
Leasehold improvements				
- fair value	**385,035**	354,515	**385,035**	354,515
- accumulated depreciation	**(123,398)**	(107,348)	**(123,398)**	(107,348)
	261,637	247,167	**261,637**	247,167
- work in progress	**50,589**	56,420	**50,589**	56,420
Total leasehold improvements	**312,226**	303,587	**312,226**	303,587
Buildings under finance lease				
- fair value	**188,689**	188,689	**188,689**	188,689
- accumulated depreciation	**(70,229)**	(63,528)	**(70,229)**	(63,528)
Total buildings under finance lease	**118,460**	125,161	**118,460**	125,161
Total land and buildings	**1,567,086**	1,581,745	**1,567,086**	1,581,745

All revaluations are conducted in accordance with the revaluation policy stated in Note 1.17. Land and buildings were revalued as at 30 June 2011 by a panel of independent valuers. The primary valuer was CB Richard Ellis.
No indicators of impairment were identified for land and buildings.

Note 11: Plant and equipment

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
Plant and equipment					
- fair value		**789,068**	760,519	**789,068**	760,519
- accumulated depreciation		**(490,406)**	(463,677)	**(490,406)**	(463,677)
		298,662	296,842	**298,662**	296,842
- work in progress		**119,572**	102,310	**119,572**	102,310
Total plant and equipment		**418,234**	399,152	**418,234**	399,152
Research vessels					
- fair value		**80,339**	80,453	**80,339**	80,453
- accumulated depreciation		**(76,194)**	(75,012)	**(76,194)**	(75,012)
		4,145	5,441	**4,145**	5,441
- work in progress		**96,047**	42,233	**96,047**	42,233
Total research vessels		**100,192**	47,674	**100,192**	47,674
Plant and equipment under finance lease					
- fair value		**-**	90	**-**	90
- accumulated depreciation		**-**	(65)	**-**	(65)
Total plant and equipment under finance lease		**-**	25	**-**	25
Total plant and equipment		**518,426**	446,851	**518,426**	446,851

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 12: Intangibles

Computer software	1.18				
Internally developed - in use		**42,917**	40,410	**42,917**	40,410
Internally developed - in progress		**574**	2,549	**574**	2,549
		43,491	42,959	**43,491**	42,959
Accumulated amortisation		**(18,356)**	(14,248)	**(18,356)**	(14,248)
Total intangibles		**25,135**	28,711	**25,135**	28,711

No indicators of impairment were identified for intangible assets.

Notes 10 – 12 Land, buildings, plant and equipment and intangibles (cont)

(a) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles (2012-13) - Consolidated

	Land	Buildings	Total land and buildings	Plant and equipment	Internally developed software	Total
	$'000	$'000	$'000	$'000	$'000	$'000
As at 1 July 2012						
Gross book value	378,593	2,308,404	2,686,997	985,605	42,959	3,715,561
Accumulated depreciation and impairment	-	(1,105,252)	(1,105,252)	(538,754)	(14,248)	(1,658,254)
Net book value as at 1 July 2012	378,593	1,203,152	1,581,745	446,851	28,711	2,057,307
Additions:						
By purchase	-	55,598	55,598	121,645	537	177,780
Reclassification	-	84	84	(84)	-	-
Revaluations 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)
Adjustment to prior period	-	961	961	-	-	961
Net book value as at 30 June 2013	378,593	1,188,493	1,567,086	518,426	25,135	2,110,647
Net book value as at 30 June 2013 represented by:						
Gross book value	378,593	2,364,312	2,742,905	1,085,026	43,491	3,871,422
Accumulated depreciation and impairment	-	(1,175,819)	(1,175,819)	(566,600)	(18,356)	(1,760,775)
	378,593	1,188,493	1,567,086	518,426	25,135	2,110,647

(a) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles (2011-12) - Consolidated

	Land	Buildings	Total land and buildings	Plant and equipment	Internally developed software	Total
	$'000	$'000	$'000	$'000	$'000	$'000
As at 1 July 2011						
Gross book value	386,572	2,249,902	2,636,474	858,028	38,352	3,532,854
Accumulated depreciation and impairment	-	(1,037,871)	(1,037,871)	(476,883)	(10,006)	(1,524,760)
Net book value as at 1 July 2011	386,572	1,212,031	1,598,603	381,145	28,346	2,008,094
Additions:						
By purchase	-	65,669	65,669	111,503	4,607	181,779
Reclassification	(8,177)	(5,654)	(13,831)	-	-	(13,831)
Revaluation and impairments	200	519	719	695	-	1,414
Depreciation expense	-	(69,413)	(69,413)	(45,029)	(4,242)	(118,684)
Disposals	(2)	-	(2)	(1,463)	-	(1,465)
Net book value as at 30 June 2012	378,593	1,203,152	1,581,745	446,851	28,711	2,057,307
Net book value as at 30 June 2012 represented by:						
Gross book value	378,593	2,308,404	2,686,997	985,605	42,959	3,715,561
Accumulated depreciation and impairment	-	(1,105,252)	(1,105,252)	(538,754)	(14,248)	(1,658,254)
	378,593	1,203,152	1,581,745	446,851	28,711	2,057,307

Note 13: Investment properties

	Notes	Consolidated		CSIRO	
		2013 $'000	2012 $'000	2013 $'000	2012 $'000
Investment properties - fair value	1.19	**52,150**	52,000	**52,150**	52,000
Reconciliation of the opening and closing balances of investment properties					
As at 1 July		**52,000**	50,950	**52,000**	50,950
Net gain from fair value adjustments		**150**	1,050	**150**	1,050
Net book value as at 30 June		**52,150**	52,000	**52,150**	52,000

As at 30 June 2013 investment properties comprise properties that are leased to third parties. The lease contains an initial non-cancellable period of ten years. No contingent rents are charged. Rental income from investment properties was $3.5 million (2012: $2.8 million). No separate record was maintained on direct operating expenses including repairs and maintenance for those investment properties. Fair value gain on investment properties for the year was $0.15 million (2012: $1.1 million).

No indicators of impairment were identified for investment properties.

Note 14: Inventories held for sale

Books and media products - at lower cost and net realisable value	1.20	1,162	1,163	1,162	1,163

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 15: Other non-financial assets

Contract research work in progress - at cost	1.6	**46,250**	34,199	**46,250**	34,199
Other prepayments		**6,857**	7,897	**6,857**	7,895
Total other non-financial assets		**53,107**	42,096	**53,107**	42,094

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 16: Properties held for sale

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
Properties held for sale	1.29	**8,583**	14,319	**8,583**	14,319
Reconciliation of the opening and closing balances of properties held for sale					
As at 1 July		**14,319**	11,865	**14,319**	11,865
Reclassification		**-**	13,831	**-**	13,831
Disposals		**(4,936)**	(9,749)	**(4,936)**	(9,749)
Impairment loss on revaluation		**(800)**	(1,628)	**(800)**	(1,628)
Net book value as at 30 June		**8,583**	14,319	**8,583**	14,319

Balance as at 30 June 2013 represents properties identified as surplus to CSIRO and classified as 'held for sale'. These properties have been valued by independent valuers. They are expected to be sold in the market and settled within the next 12 months. An impairment loss of $0.8 million on the re-measurement of properties held for sale to the lower of their carrying amount and fair value cost to sell, has been recognised in the Statement of Comprehensive Income (2012: impairment loss $1.6 million).

Note 17: Suppliers

Trade creditors and accruals		**62,433**	72,152	**61,779**	70,438
Suppliers payable expected to be settled within 12 months.					
Related entities		**1,126**	1,241	**1,126**	1,241
External parties		**61,307**	70,911	**60,653**	69,197
Total		**62,433**	72,152	**61,779**	70,438

Settlement is usually made within 30 days.

Note 18: Other payables

Accrued salaries and wages		**22,582**	23,749	**21,413**	22,310
Redundancies		**18,885**	5,836	**18,885**	5,836
Contract research revenue received in advance	1.6	**93,193**	106,370	**93,193**	106,370
Other revenue received in advance		**16,046**	19,869	**16,046**	19,869
Other creditors and accrued expenses		**21,351**	15,241	**22,111**	18,010
Payment to the Commonwealth		**28,290**	-	**28,290**	-
Total other payables		**200,347**	171,065	**199,938**	172,395

All other payables are expected to be settled within 12 months.

Note 19: Finance Leases

	Notes	Consolidated		CSIRO	
		2013 $'000	2012 $'000	2013 $'000	2012 $'000
Finance leases		**57,243**	61,033	**57,243**	61,033
Total finance leases		**57,243**	61,033	**57,243**	61,033
Payable:					
Within one year:					
Minimum lease payments		**7,612**	7,034	**7,612**	7,034
Deduct: future finance charges		**(2,647)**	(2,756)	**(2,647)**	(2,756)
Total payable within one year (current)		**4,965**	4,278	**4,965**	4,278
In one to five years:					
Minimum lease payments		**26,517**	28,062	**26,517**	28,062
Deduct: future finance charges		**(8,382)**	(9,195)	**(8,382)**	(9,195)
Total payable within one to five years		**18,135**	18,867	**18,135**	18,867
In more than five years:					
Minimum lease payments		**39,549**	45,089	**39,549**	45,089
Deduct: future finance charges		**(5,406)**	(7,201)	**(5,406)**	(7,201)
Total payable in more than five years		**34,143**	37,888	**34,143**	37,888
Total finance leases recognised on the Balance Sheet		**57,243**	61,033	**57,243**	61,033

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 (2012: 5% per annum). The lease liabilities are secured by the lease assets.

Note 20: Deposits

	Notes	Consolidated		CSIRO	
		2013 $'000	2012 $'000	2013 $'000	2012 $'000
Deposits		**6,337**	7,130	**6,337**	7,130
Deposits represent monies held on behalf of the following third parties:					
Goyder Institute of Water Research		**5,000**	5,566	**5,000**	5,566
Others		**1,337**	1,564	**1,337**	1,564
Total deposits		**6,337**	7,130	**6,337**	7,130

All deposits are expected to be settled within the next 12 months.

Note 21: Employee provisions

Annual leave		**66,493**	63,816	**66,493**	63,816
Long service leave		**174,536**	176,532	**174,536**	176,532
Severance pay		**7,024**	6,506	**7,024**	6,506
Total employee provisions		**248,053**	246,854	**248,053**	246,854
Employee provisions are expected to be settled in:					
No more than 12 months		**44,453**	44,239	**44,453**	44,239
More than 12 months		**203,600**	202,615	**203,600**	202,615
Total employee provisions		**248,053**	246,854	**248,053**	246,854

Note 22: Cash flow reconciliation

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
Reconciliation of cash and cash equivalents as per Balance Sheet to Cash Flow Statement					
Cash and cash equivalents as per:					
Cash Flow Statement		**404,638**	381,687	**283,013**	240,976
Balance Sheet	6	**404,638**	381,687	**283,013**	240,976
Difference		**-**	-	**-**	-
Reconciliation of net cost of services to net cash from operating activities:					
Net cost of services		**(774,903)**	(531,384)	**(755,302)**	(524,479)
Add revenue from Government		**733,817**	724,939	**733,817**	724,939
Share of net operating surplus/(deficit) of joint venture accounted for using the equity method		**(53)**	10	**(53)**	10
Adjustments for non-cash items					
Depreciation and amortisation		**122,906**	118,684	**122,906**	118,684
Net write-down and impairment of assets		**7,157**	19,357	**7,157**	19,357
(Gains)/loss from sale of property, plant and equipment		**874**	(379)	**874**	(379)
(Gains)/loss from sale of equity investments and intellectual property		**-**	(30)	**-**	(30)
Other revenue not providing cash		**(2,961)**	-	**(2,961)**	-
Changes in assets/liabilities					
(Increase)/decrease in trade and other receivables		**77,685**	(157,793)	**77,851**	(158,433)
(Increase)/decrease in inventories		**1**	(153)	**1**	(153)
(Increase)/decrease in other non-financial assets		**(11,011)**	(1,234)	**(11,013)**	(1,232)
(Increase)/decrease in other financial asset		**353**	-	**353**	-
(Increase)/decrease in GST receivable		**(576)**	(1,103)	**(576)**	(771)
Increase/(decrease) in GST payable		**-**	(1,199)	**-**	(1,569)
Increase/(decrease) in employee liabilities		**1,199**	41,290	**1,199**	41,290
Increase/(decrease) in supplier payables		**(13,389)**	(12,043)	**(12,449)**	(13,312)
Increase/(decrease) in other payables		**992**	19,116	**(747)**	20,433
Increase/(decrease) in deposits-liabilities		**(793)**	658	**(793)**	658
Net cash from operating activities		**141,298**	218,736	**160,264**	225,013

Note 23: Contingent assets and liabilities

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
Quantifiable Contingencies					
Contingent assets					
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.					
Bank guarantees received from suppliers.		**406**	4,597	**406**	4,597
Bank guarantees received against a convertible note.		**-**	1,200	**-**	1,200
Anticipated net insurance claims.		**931**	1,863	**931**	1,863
Total contingent assets		**1,337**	7,660	**1,337**	7,660
Contingent liabilities					
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.		**(400)**	(300)	**(400)**	(300)
Financial guarantee for an export agreement.		**(45)**	(45)	**(45)**	(45)
Total contingent liabilities		**(445)**	(345)	**(445)**	(345)
Total net contingent asset/(liability)		**892**	7,315	**892**	7,315

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. Trials are set for February 2014 and July 2015 respectively in those two cases. In August 2013 a further proceeding was filed in Germany seeking damages for patent infringement. If successful in these actions, CSIRO expects to receive significant revenue which would exceed the associated legal cost. At this stage, the revenue and costs are considered unquantifiable.

Note 24: 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 the CSIRO's share of the new entity is treated either as subsidiary, joint venture or associate in the Balance Sheet as appropriate.

CSIRO's total cash and in-kind contribution (e.g. staff and use of assets) to CRCs from its own resources was $13.6 million for the year (2012: $26.8 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 CRCs in which CSIRO is a participant.

CSIRO is a participant in the following CRCs as at 30 June 2013.

Name of CRC	Expected termination date
Advanced Manufacturing CRC	30/06/14
Antarctic Climate and Ecosystems CRC	30/06/17
Australian Poultry CRC	30/06/17
Australian Seafood CRC	30/06/14
Auto CRC	30/06/17
Bushfire CRC	30/06/13
CAST CRC*	30/06/12
CRC for Cancer Therapeutics	30/06/14
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
Future Farm Industries CRC	30/06/14
Greenhouse Gas Technologies CRC	30/06/15
Invasive Animals CRC	30/06/17
National Plant Biosecurity CRC	30/06/18
Remote Economic Participation CRC	30/06/17
Sheep Industry Innovation CRC	30/06/14
Vision CRC	30/06/17

*After 30 June 2012, CSIRO continued to have short-term contracts with CAST until the end of June 2013.

Note 25: Resources made available to the Group and not included in the Balance Sheet

	Land	Buildings	Plant and Equipment	Total
	$'000	$'000	$'000	$'000
At cost or fair value	4,615	153	37,584	42,352
Accumulated depreciation	-	-	(25,218)	(25,218)
Net value as at 30 June 2013	**4,615**	**153**	**12,366**	**17,134**
Net value as at 30 June 2012	**4,615**	**153**	**11,267**	**16,035**

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.

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. The fair value of the continuing use of these assets could not be reliably determined and therefore are not brought to account in the Statement of Comprehensive Income.

Note 26: Monies held in trust

	2013	2012
	$'000	$'000
Monies held in trust represented by cash, deposits and investments for the benefit of the Group which are not included in the Balance Sheet are:		
The Sir Ian McLennan Achievement for Industry Award - established to award outstanding contributions by the Group's scientists and engineers to national development.	**301**	264
The Elwood and Hannah Zimmerman Trust Fund - established to fund weevil research and the curation of the Australian National Insect Collection (ANIC) weevil collection.	**4,999**	4,729
The Schlinger Trust - established to research the taxonomy, biosystematics, general biology and biogeography of Australasian Diptera conducted by the Australian National Insect Collection.	**2,420**	2,421
Total monies held in trust as at 30 June	**7,720**	7,414

Movement summary of monies held in trust:

	McLennan	Zimmerman	Schlinger	Total
	$'000	$'000	$'000	$'000
Balance as at 1 July 2012	264	4,729	2,421	7,414
Interest and distribution	37	560	82	679
Expenditure	-	(290)	(83)	(373)
Balance as at 30 June 2013	**301**	**4,999**	**2,420**	**7,720**

Note 27: 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 11 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, also known as the 'ISR Munro Ichthyological Collection', houses more than 80,000 registered adult and 40,000 registered larval specimens of almost 3,000 species from Australasia, Asia, Antarctica, and the Sub Antarctic Islands. It is among Australia's most diverse ichthyological collections and contains one of the largest collections of sharks, rays and deepwater fishes in the Southern Hemisphere.

Other collections include, but are not limited to, the Australian Tree Seed Collection, the Dadswell Memorial Wood Collection, CSIRO collection of living microalgae and the Wood-Inhabiting fungi collection.

Note 28: Auditor's remuneration[1]

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$	$	$	$
Amounts received or due and receivable by the Group's auditors for:					
An audit of the financial statements of CSIRO and the consolidated entity		**234,900**	221,900	**223,000**	210,000
Other non-audit related[2]		**156,601**	112,369	**156,601**	112,369
		391,501	**334,269**	**379,601**	**322,369**

[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 and governance services.

Note 29: 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	**495,003**	411,527	**495,003**	411,527
Payments to superannuation funds for Board Members	**44,212**	35,763	**44,212**	35,763
Total remuneration	**539,215**	447,290	**539,215**	447,290

The remuneration of the Chief Executive Officer, who is also a Board Member of the Group is reported under Note 30 Senior Executive Remuneration.

The number of Board Members whose total remuneration fell within the following bands were:

$	Number	Number	Number	Number
0 - 29,999	**2**	4	**2**	4
30,000 - 59,999	**4**	4	**4**	4
60,000 - 89,999	**3**	2	**3**	2
90,000 - 119,999	**1**	1	**1**	1
Total	**10**	11	**10**	11

Note 30: Senior Executive Remuneration

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$	$	$	$
Note 30 Senior Executive Remuneration					
(a) Senior Executive remuneration expense for the reporting period[1&2]					
Short-term employee benefits:					
Salary		**6,742,392**	6,861,967	**6,742,392**	6,861,967
Annual leave accrued		**738,377**	614,281	**738,377**	614,281
Performance bonuses		**1,637,312**	1,703,006	**1,637,312**	1,703,006
Additional allowances		**501,240**	486,559	**501,240**	486,559
Total short-term employee benefits		**9,619,321**	9,665,813	**9,619,321**	9,665,813
Post-employment benefits:					
Superannuation		**1,055,365**	1,000,704	**1,055,365**	1,000,704
Total post-employment benefits		**1,055,365**	1,000,704	**1,055,365**	1,000,704
Other long-term benefits:					
Long-service leave[3]		**769,936**	795,515	**769,936**	795,515
Total other long-term benefits		**769,936**	795,515	**769,936**	795,515
Termination benefits		**-**	41,878	**-**	41,878
Total termination benefits		**-**	41,878	**-**	41,878
Total		**11,444,622**	11,503,910	**11,444,622**	11,503,910

Notes:
2012 comparatives have been updated to represent the changes in 2013 FMOs.

[1] Note 30 (a) is prepared on an accrual basis (therefore the performance bonus expenses disclosed above may differ from the cash 'bonus paid' in Note 30 (b)).
[2] Note 30 (a) excludes acting arrangements and part-year service where total remuneration expenses for a senior executive was less than $180,000.
[3] The movement in long service leave includes the impact of the increased discounting factor for employee provisions as at 30 June 2013.

Note 30 (b) Average annual reportable remuneration paid to substantive senior executives during the reporting period

	2013					
Average annual reportable remuneration[1]	**Senior executives number**	**Reportable salary[2&6] $**	**Contributed superannuation[3] $**	**Reportable allowances[4] $**	**Bonus paid[5] $**	**Total $**
Total remuneration (including part-time arrangements):						
less than $180,000	**9**	**60,676**	**8,921**	**-**	**7,652**	**77,249**
$180,000 to $209,999	**2**	**137,603**	**20,045**	**-**	**43,144**	**200,792**
$210,000 to $239,999	**3**	**199,572**	**27,292**	**-**	**4,500**	**231,364**
$240,000 to $269,999	**2**	**184,130**	**28,075**	**-**	**47,810**	**260,015**
$270,000 to $299,999	**6**	**205,200**	**29,156**	**-**	**51,258**	**285,614**
$300,000 to $329,999	**6**	**232,353**	**30,144**	**-**	**54,327**	**316,824**
$330,000 to $359,999	**2**	**282,243**	**23,807**	**-**	**47,466**	**353,516**
$360,000 to $389,999	**1**	**278,846**	**39,548**	**-**	**62,571**	**380,965**
$390,000 to $419,999	**2**	**292,313**	**47,958**	**-**	**72,232**	**412,503**
$420,000 to $449,999	**3**	**303,842**	**48,457**	**-**	**79,891**	**432,190**
$480,000 to $509,999	**1**	**352,689**	**51,689**	**-**	**83,832**	**488,210**
$780,000 to $809,999	**1**	**566,329**	**66,336**	**-**	**157,550**	**790,215**
Total	**38**					

Note 30 (b) Average annual reportable remuneration paid to substantive senior executives during the reporting period

	2012					
Average annual reportable remuneration[1]	Senior executives	Reportable salary[2&6]	Contributed superannuation[3]	Reportable allowances[4]	Bonus paid[5]	Total
	Number	$	$	$	$	$
Total remuneration (including part-time arrangements):						
less than $180,000	1	144,390	20,218	-	-	164,608
$240,000 to $269,999	3	204,425	24,798	-	29,609	258,832
$270,000 to $299,999	8	210,800	25,256	-	48,550	284,606
$300,000 to $329,999	6	233,343	27,244	-	54,073	314,659
$330,000 to $359,999	5	230,748	33,576	-	80,331	344,655
$360,000 to $389,999	3	281,497	35,364	-	59,607	376,468
$390,000 to $419,999	2	302,127	31,165	-	70,060	403,352
$420,000 to $449,999	1	313,118	39,639	-	75,495	428,252
$450,000 to $479,999	1	339,679	40,890	-	82,457	463,026
$480,000 to $509,999	1	342,538	59,063	-	88,040	489,641
$720,000 to $749,999	1	523,520	64,478	-	149,523	737,521
Total	**32**					

Notes:

1. This table reports substantive senior executives who received remuneration during the reporting period. Movement in the number of senior executives represents recruitment and cessations through the period and not an overall increase in number. 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; and
   (d) salary sacrificed benefits.
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 30 (c) Average annual reportable remuneration paid to other highly paid staff during the reporting period - Consolidated

			2013			
Average annual reportable remuneration[1]	**Senior Executives number**	**Reportable salary[2&6] $**	**Contributed superannuation[3] $**	**Reportable allowances[4] $**	**Bonus paid[5] $**	**Total $**
Total reportable remuneration (including part-time arrangements):						
$180,000 to $209,999	**242**	**163,061**	**24,562**	**-**	**3,398**	**191,021**
$210,000 to $239,999	**82**	**188,865**	**27,354**	**-**	**7,313**	**223,532**
$240,000 to $269,999	**30**	**196,713**	**26,714**	**-**	**25,608**	**249,035**
$270,000 to $299,999	**6**	**199,677**	**44,751**	**-**	**35,302**	**279,730**
$300,000 to $329,999	**3**	**220,712**	**57,442**	**-**	**36,489**	**314,643**
$330,000 to $359,999	**4**	**253,864**	**31,653**	**-**	**58,363**	**343,880**
$360,000 to $389,999	**2**	**169,183**	**25,799**	**-**	**178,600**	**373,582**
Total	**369**					

Note 30 (c) Average annual reportable remuneration paid to other highly paid staff during the reporting period - Consolidated

			2012			
Average annual reportable remuneration[1]	Senior Executives	Reportable salary[2&6]	Contributed superannuation[3]	Reportable allowances[4]	Bonus paid[5]	Total
	No.	$	$	$	$	$
Total reportable remuneration (including part-time arrangements):						
$180,000 to $209,999	163	165,385	23,943	-	4,154	193,482
$210,000 to $239,999	74	185,303	26,483	-	12,217	224,003
$240,000 to $269,999	19	203,592	24,927	-	19,941	248,459
$270,000 to $299,999	5	199,180	44,794	-	40,206	284,180
$300,000 to $329,999	7	236,013	30,909	-	43,800	310,722
$330,000 to $359,999	3	256,497	39,433	-	48,549	344,479
$360,000 to $389,999	1	281,013	15,775	-	65,485	362,273
$420,000 to $449,999	1	338,907	15,775	-	74,240	428,923
Total	273					

***Notes*:**

1. This table reports staff:
   (a) who were employed by the entity during the reporting period and includes recruitment and cessations through the period;
   (b) whose reportable remuneration was $180,000 or more for the financial period; and
   (c) were not required to be disclosed in Tables 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; and
   (d) salary sacrificed benefits.

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 2012-13 in the salary band $360,000 to $389,999 (2011-12: $210,000 to $239,999).

Note 31: Meetings of the Board and Board Committees

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 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 2012. Dr Russell resigned effective 2 November 2012. Ms Bennett was appointed on 25 October 2012.

Note 31: Meetings of the Board and Board Committees – (cont)

During the 2011-12 financial year seven Board meetings, five Board Audit Committee meetings, five Board Nominations and Remuneration Committee meetings and five Board Commercial Committee meetings were held. The number of meetings attended by each of the eligible Board members was as follows;

Board member	CSIRO Board		CSIRO Board Audit Committee		CSIRO Board Commercial Committee		CSIRO Board Nominations and Remuneration 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	Number eligible to attend as a member	Number attended
M S Boydell	7	6	5	5	-	4	-	1
I Chubb*	3	2	-	-	-	-	2	1
M E Clark	7	7	-	4	-	5	-	4
T A Cutler	7	5	5	4	5	4	-	1
E J Doyle	7	6	3	3	2	4	5	5
P Høj	4	2	1	1	-	-	-	1
S In't Veld	-	-	-	-	-	-	-	-
J Kerin*	1	1	2	2	-	1	-	1
S McKeon	7	7	-	1	5	4	5	3
J H Ranck	7	7	-	3	5	5	5	5
D Russell*	5	6	-	-	-	1	-	-
T H Spurling*	5	7	-	-	4	5	4	5

Notes:

Professor Spurling's term expired on 30 April 2012. He was reappointed on 28 June 2012. He attended two Board meetings, one Board Commercial Committee Meeting and one Board Nominations and Remuneration Committee as an observer.

Dr Russell was appointed on 19 October 2011. He attended one Board Meeting as an observer.

Professor Ian Chubb resigned on 8 December 2011 and the Hon John Kerin's term was completed on 2 October 2011.

Note 32: Related party disclosures

(a) **Controlled Entities**

The Science and Industry Endowment Fund 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 Science and Industry Endowment Fund is to provide assistance to persons engaged in scientific research and in training of students in scientific research.

WLAN Services Pty Ltd 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.

Names	CSIRO Investment Amount		% Equity Interest Held	
	2013 $	2012 $	2013 $	2012 $
Science and Industry Endowment Fund (SIEF)	-	-	100%	100%
WLAN Services Pty Ltd	1	1	100%	100%
Total	**1**	**1**		

(b) Board Members

The Board Members of the Group during the financial year were:

S McKeon AO (Chairman)
E J Doyle (Deputy Chairman)
M E Clark (Chief Executive)
J Bennett (commenced 25 October 2012)
M S Boydell
T A Cutler (term completed 24 July 2012)
P Høj
S In't Veld
J H Ranck
D Russell (resigned 2 November 2012)
T H Spurling

Remuneration – the aggregate remuneration of Board Members is disclosed in Note 29.

(c) Board Members' interest in contracts

Since 1 July 2012 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 29 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 2012 to 30 June 2013.

Note 32: 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, Tasmanian Water and Sewerage Corporations Northern Region (trading as Ben Lomond Water), Tasmanian Ports Corporation and Tasmanian Water and Sewerage Corporations Common Services (trading as Onstream). 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. 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 Chairperson of the Gladstone Area Water Board. Ms Boydell is a Director of Uniquest Pty Limited and UATC Pty Ltd. During 2012-13 Ms Boydell ceased to be Acting Commissioner of the Queensland Water Commission. 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 Executive Committee of the Global Research Alliance, a member of the World Economic Forum, Global Advisory Council for Measuring Sustainability, Manufacturing Leaders Group, 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, a member of the Chairman's panel of the Great Barrier Reef Foundation and is 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 T A Cutler is the Principal of Cutler & Company, a technology and strategy consultancy. He is also a Director of The Conversation Ltd and MHM Higher Education Pty Ltd. He is Chairman of the Advisory Board of the Centre of Excellence for Creative Industries and Innovation and is a member of the Design Research Institute Advisory Board RMIT and RMIT College of Business Industry Advisory Board. Dr Cutler is Chair of the Open Technology Foundation and Chairman of The Centre for the Study of Choice Advisory Board, UTS. Dr Cutler is also Chair-elect of the Fundación CSIRO Chile Research which will be a CSIRO controlled entity. 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, except in the case of the Fundación CSIRO Chile Research for which Dr Cutler is paid a fee by CSIRO.

Dr E J Doyle is Chair of the Hunter Valley Research Foundation. She is also Chair of the Hunter Founders Forum and a Director of GPT Ltd and Boral Ltd. Dr Doyle is also a non-Executive Director of Bradken Limited, a member of the Enterprise Connect Advisory Council and a Conjoint Professor at the University of Newcastle Graduate School of Business. During 2012-13 Dr Doyle was appointed a Non Executive Director of Newcastle Port Corporation. 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 2012-13 Professor Høj ceased as Vice Chancellor and President of the University of South Australia, Deputy Chair of Universities Australia, and as a member of the Australian Qualifications Framework Council. He also ended his Directorship of the South Australian Health and Medical Research Institute (SAHMRI). 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 32: Related party disclosures (cont)

(d) Other transactions of Board Members – related entities

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). During 2012-13 Ms In't Veld became a non-Executive Director of the DUET Group and a member of the CSIRO Energy Strategic Advisory Committee. 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 S McKeon is the Executive Chairman of Macquarie Group's Melbourne Office, Chairman of Business for Millennium Development and Global Poverty Project Australia and is a member of the AusAid Business Engagement Steering Committee. He is a Director of Global Poverty Project Inc and Red Dust Role Models and a member of the Federal Government's Human Rights Grants Scheme Advisory Panel and the Victorian Government's National Disability Insurance Scheme Implementation Taskforce. During 2012-13 Mr McKeon became a Director of AMP and the Board Chair of In2Science. He retired from the Board of Vision Fund International and the 2012 Federal Government Review into Medical and Health Research, of which Mr McKeon is Chair, has been completed. 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 Elders and Innotegic Pty Ltd. During 2012-13 he became a Director of Iluka Resources, a member of the Sydney University Senate Committee on Risk and Safety and ceased to be a member of the Board of the Bush Heritage Foundation. 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 D Russell is Secretary of the Commonwealth Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education. He is also a Member of the Australian National Institute of Public Policy - ANU Board, Education Investment Fund (EIF) Advisory Board, Melbourne Institute Advisory Board - Melbourne University and Standard Business Reporting Board (SBR) - Treasury. 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 Research Professor in the Faculty of Life and Social Sciences, Swinburne University of Technology, Victoria. He is also a member of the Board of the International Centre for Radio Astronomy Research and Chairman of the Board of Advanced Molecular Technologies Pty Ltd. During 2012-13 he became 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 the Australian Academy of Technological Sciences (ATSE) on this project. 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 33: Financial instruments

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
(a) Categories of financial instruments					
Financial Assets					
Available for sale financial assets					
Investments	9	**10,520**	17,142	**10,520**	17,142
Loans and receivables:					
Cash at bank	6	**48,417**	35,755	**45,013**	35,713
Term deposits	6	**356,221**	345,932	**238,000**	205,263
Receivable for goods and services	7	**82,112**	76,147	**82,112**	76,147
Other receivables	7	**85,488**	172,161	**86,471**	172,301
Carrying amount of financial assets		**582,758**	647,137	**462,116**	506,566
Financial Liabilities					
Finance lease liabilities	19	**57,243**	61,033	**57,243**	61,033
Trade creditors	17	**62,433**	72,152	**61,779**	70,438
Research revenue received in advance	18	**93,193**	106,370	**93,193**	106,370
Deposits	20	**6,337**	7,130	**6,337**	7,130
Other creditors	18	**107,154**	64,695	**106,745**	66,025
Carrying amount of financial liabilities		**326,360**	311,380	**325,297**	310,996
(b) Net income and expense from financial assets					
Cash at bank and term deposits					
Interest revenue	4.2	**18,070**	17,890	**11,529**	9,195
Net gain from financial assets		**18,070**	17,890	**11,529**	9,195
(c) Net income and expense from financial liabilities					
Finance leases					
Interest expense	3.4	**2,865**	3,271	**2,864**	3,271
Net loss from financial liabilities		**2,865**	3,271	**2,864**	3,271

(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 Balance Sheet are a reasonable approximation of the fair value of these financial assets and liabilities.

(e) Fair value hierarchy

The table below analyses financial instruments carried at fair value, by valuation method. The different levels have been defined as follows:

Level 1: quoted prices (unadjusted) in active markets for identical assets and liabilities.
Level 2: inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly (i.e. as prices) or indirectly (i.e. derived from prices).
Level 3: inputs for the asset or liability that are not based on observable market data (unobservable inputs).-

There have been no transfers to or from Level 1 and Level 3 during the year ended 30 June 2013 (2012: no transfers in either direction).

Note 33: Financial instruments (cont)

(e) Fair value hierarchy (cont)

	Notes	Consolidated		CSIRO	
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
Fair value measurements categorised by fair value hierarchy					
Level 1	9	**3,195**	5,166	**3,195**	5,166
Level 2		**-**	-	**-**	-
Level 3	9	**7,325**	11,976	**7,325**	11,976
Total		**10,520**	17,142	**10,520**	17,142
Reconciliation of Level 3 fair value hierarchy					
As at 1 July		**11,976**	21,508	**11,976**	21,508
Total losses for the period recognised in statement of comprehensive income[1]	3.5	**(5,089)**	(12,832)	**(5,089)**	(12,832)
Total gains/(losses) recognised in other comprehensive income	5.2	**(450)**	26	**(450)**	26
Purchases		**1,188**	1,668	**1,188**	1,668
Sales		**(300)**	-	**(300)**	-
Issues		**-**	1,606	**-**	1,606
Closing balance		**7,325**	11,976	**7,325**	11,976

[1] These losses are presented in the Statement of Comprehensive Income Note 3.5.

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 Guidelines (AVCAL)'.

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 AVCAL 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.

Note 33: Financial instruments (cont)

(f) 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 (gross) of $171.1 million (2012: $249.4 million). The Group has assessed the risk of the default on payment and has allocated $0.8 million (2012 $1.5 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
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
Cash at bank	6	**48,417**	35,755	**-**	-
Term deposits	6	**356,221**	345,932	**-**	-
Receivables for goods and services	7	**71,007**	64,960	**11,105**	11,187
Other receivables	7	**85,488**	172,161	**-**	-
Investments	9	**10,520**	17,142	**-**	-
Total		**571,653**	635,950	**11,105**	11,187

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
		2013	2012	2013	2012
		$'000	$'000	$'000	$'000
Cash at bank	6	**45,013**	35,713	**-**	-
Term deposits	6	**238,000**	205,263	**-**	-
Receivables for goods and services	7	**71,007**	64,960	**11,105**	11,187
Other receivables	7	**86,471**	172,301	**-**	-
Investments	9	**10,520**	17,142	**-**	-
Total		**451,011**	495,379	**11,105**	11,187

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**

Ageing of financial assets that were past due but not impaired for 2012 - 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	7,736	1,647	311	1,493	11,187
Total	7,736	1,647	311	1,493	11,187

Note 33: Financial instruments (cont)

(f) Credit risk (cont)

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

Ageing of financial assets that were past due but not impaired for 2012 - 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	7,736	1,647	311	1,493	11,187
Total	7,736	1,647	311	1,493	11,187

(g) 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 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	-	107,154	-	-	107,154
Total	6,337	267,745	18,135	34,143	326,360

The following table illustrates the maturities for financial liabilities for 2012 - Consolidated

	On demand	Within 1 year	1 to 5 years	> 5 years	Total
	$'000	$'000	$'000	$'000	$'000
Finance lease liabilities	-	4,278	18,867	37,888	61,033
Trade creditors	-	72,152	-	-	72,152
Research revenue received in advance	-	106,370	-	-	106,370
Deposits	7,130	-	-	-	7,130
Other creditors	-	64,695	-	-	64,695
Total	7,130	247,495	18,867	37,888	311,380

Note 33: Financial instruments (cont)

(g) Liquidity risk (cont)

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	-	106,745	-	-	106,745
Total	6,337	266,682	18,135	34,143	325,297

The following table illustrates the maturities for financial liabilities for 2012 - CSIRO

	On demand	Within 1 year	1 to 5 years	> 5 years	Total
	$'000	$'000	$'000	$'000	$'000
Finance lease liabilities	-	4,278	18,867	37,888	61,033
Trade creditors	-	70,438	-	-	70,438
Research revenue received in advance	-	106,370	-	-	106,370
Deposits	7,130	-	-	-	7,130
Other creditors	-	66,025	-	-	66,025
Total	7,130	247,111	18,867	37,888	310,996

(h) 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 Balance Sheet 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 9.

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 $0.3 million (2012: $0.5 million). An equal change in the opposite direction would have decreased equity by $0.3 million (2012: $0.5 million). The analysis is performed on the same basis for 2012.

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 34: Financial assets and liabilities reconciliation

	Notes	Consolidated		CSIRO	
		2013	2012	**2013**	2012
		$'000	$'000	**$'000**	$'000
(a) Financial assets					
Total financial assets as per Balance Sheet		**585,703**	647,112	**463,720**	506,209
Add: non-financial instrument components					
Impairment allowance for goods and services	7	**834**	1,527	**834**	1,527
Less: non-financial instrument components					
GST receivable from ATO		**(3,433)**	(1,103)	**(2,092)**	(771)
Investments accounted for using equity method	8	**(346)**	(399)	**(346)**	(399)
Total financial instrument components		**(2,945)**	25	**(1,604)**	357
Total financial assets as per financial instrument note	33(a)	**582,758**	647,137	**462,116**	506,566
(b) Financial liabilities					
Total financial liabilities as per Balance Sheet		**574,413**	558,234	**573,350**	557,850
Less: non-financial instrument components					
Employee provisions	21	**(248,053)**	(246,854)	**(248,053)**	(246,854)
Total non-financial instrument components		**(248,053)**	(246,854)	**(248,053)**	(246,854)
Total financial liabilities as per financial instrument note	33(a)	**326,360**	311,380	**325,297**	310,996

Note 35: Reporting of outcome

(a) Reporting of outcome

The Organisation's 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**	
	2013	2012	**2013**	2012
	$'000	$'000	**$'000**	$'000
Total expenses[1]	**1,281,442**	1,278,568	**1,267,577**	1,275,501
Income from non-government sector				
Other external revenues:				
Sale of goods and rendering of services - to related entities	**108,452**	112,216	**120,863**	126,189
Sale of goods and rendering of services - to external parties	**304,904**	286,568	**304,299**	284,629
Interest	**18,070**	17,890	**11,529**	9,195
Net gains from sale of assets	**-**	379	**-**	379
Net gains from sale of investments	**-**	30	**-**	30
Net foreign exchange gains	**5,454**	5,127	**5,454**	5,127
Donations	**51**	29	**51**	29
Rents	**7,176**	8,253	**7,176**	8,253
Royalties	**37,548**	278,516	**37,548**	278,516
Sale of primary produce	**1,721**	1,404	**1,721**	1,404
Other	**23,110**	36,782	**23,581**	37,281
Total other own-source income	**506,486**	747,194	**512,222**	751,032
Net cost of outcome delivery	**774,956**	531,374	**755,355**	524,469

[1] Total expenses adjusted for movement in equity investment.

HENDRA VIRUS • **VACCINE TO BOOST THE FRONTLINE FIGHT AGAINST HENDRA VIRUS**

The CSIRO-developed vaccine is protecting horses around Australia from the deadly virus that can be transmitted to humans.

PART FIVE
APPENDICES

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
f +61 3 9545 2175
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 2013, CSIRO received 75 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 88
- information about CSIRO's procedures for external consultation can be found at **www.csiro.au/SAC** and **www.csiro.au/FAC**
- 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 2013, 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 2012–13, 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 2012–13, 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 02 6276 6123
f 02 6276 6437
e rosemary.caldwell@csiro.au

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, the 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)
2012–13	1,104,000	1,417,754
2011–12	1,621,697	1,096,277
2010–11	1,845,670	1,917,497
2009–10	1,249,355	2,282,903

TABLE 5.2: CONSULTANCIES 2012–13 – SUMMARY BY REASON CODE

Category code	Reason for consultancy	2012–13	
		Number of consultancies	Value $
IS	Need for independent study/evaluation	17	743,976
PA	Need for professional assistance to manage and facilitate change and its consequence	3	405,000
SS	Specialist skills were not otherwise available	4	268,778
Total		**23**	**1,417,754**

TABLE 5.3: SUMMARY BY PROCUREMENT METHOD CODE

Category code	Procurement method	2012–13	
		Number of consultancies	Value $
OT	Tenders sought from the market place through Open Approach (Request for Proposal, Request for Tender, Expressions of Interest).	0	–
PM	An existing panel member – this category includes standing offers, common use arrangements and approved supplier panels.	0	
ST	Tenders being sought from suppliers who have pre-qualified through some form of previous competitive process.	0	–
RQ	Purchasing was undertaken in accordance with Division 1 of the Commonwealth Procurement Rules (CPRs) and procurement did not require application of Division 2 of the CPRs.	24	1,417,754
EX	Exemption applied that saw CSIRO undertake the procurement as a Limited Tender as defined in Division 2 of the CPRs.	0	
Total		**24**	**1,417,754**

Appendix 4: Science and Industry Endowment Fund Annual Report 2012–13

THE FUND IN A GLOBAL CONTEXT

One of the most rewarding aspects of my role as Trustee of the Science and Industry Endowment Fund (SIEF) has been the opportunity it affords to step back and consider the role and direction of Australian science in a global context. The Fund's resources of over $150 million, principally derived from funds gifted by CSIRO, have enabled SIEF to make a contribution to the shape and direction of Australian science with a global perspective in mind.

As a Fund originating in 1926, with the purpose of funding Australian scientists to travel overseas and improve the quality of the fledgling nation's science sector, I am constantly reminded of the relevance of this enterprise for the Fund today. Even though our nation was only 25-years-old and at that time was isolated and remote from the established centres of global science, there was a clear conviction that, with appropriate investment, Australian science could achieve international standards.

Almost a century on, the Fund continues to invest in Australian science to enable Australia, not just to keep up with global standards, but to set them.

RESEARCH INFRASTRUCTURE

Under its Research Infrastructure Program, the SIEF has been investigating investments in activities that will increase collaboration between industry and researchers for the purpose of delivering world-class science. Its intention is to advance the development of major national research precincts in Australia that are global in scale and relevance, and as such all infrastructure activities must contribute to this vision for positioning Australian science in a global context.

The first such investment under this Program will support the development of an Advanced Resource Characterisation Facility (ARCF) as part of the National Resource Sciences Precinct in Perth. Together, the three instruments that are included in this facility will provide a global hub for metre-to-atomic scale analyses of mineral resources. It is envisaged that, combined with the four dimensional data integration provided by the Pawsey Centre, the ARCF will develop into a unique characterisation facility located in a resource-focused research precinct unmatched anywhere in the world.

The geographical isolation that in earlier years acted as a barrier to the development of Australian science has become an advantage in the modern age of radio astronomy. The rare commodity of radio silence made possible by this country's sparse population and geographical isolation provides the ideal conditions to foster world-leading facilities in radio astronomy.

The SIEF recognises the global importance of the Australian Square Kilometre Array Pathfinder (ASKAP) telescope currently being developed at the Murchison Radio-astronomy Observatory in Western Australia. This telescope will become the most powerful survey radio astronomy instrument on the planet. It will allow the entire visible sky to be surveyed at great sensitivity and very quickly. It is designed to survey vast tracts of the sky rather than the traditional approach of looking at a single object, thus creating massive new databases of astronomical radio sources – an unparalleled resource for the scientific community. In addition to being a world-class telescope in its own right, the ASKAP will act as a key precursor to the future international Square Kilometre Array (SKA) telescope and will itself be incorporated into Phase 1 of the SKA project to be hosted by Australia and southern Africa. The SKA will secure substantial ongoing overseas investment in Australia through the largest science project to be undertaken anywhere in the world in the next few decades (with additional international funds for construction and operation).

Recognising the global significance of this facility, SIEF has initiated a second Special Research Program to allow scope to assist the ASKAP's construction. This support is consistent with SIEF's funding for the Australian Synchrotron, another major national facility, under the SIEF Special Research Program (SPR).

PROMOTION OF SCIENCE

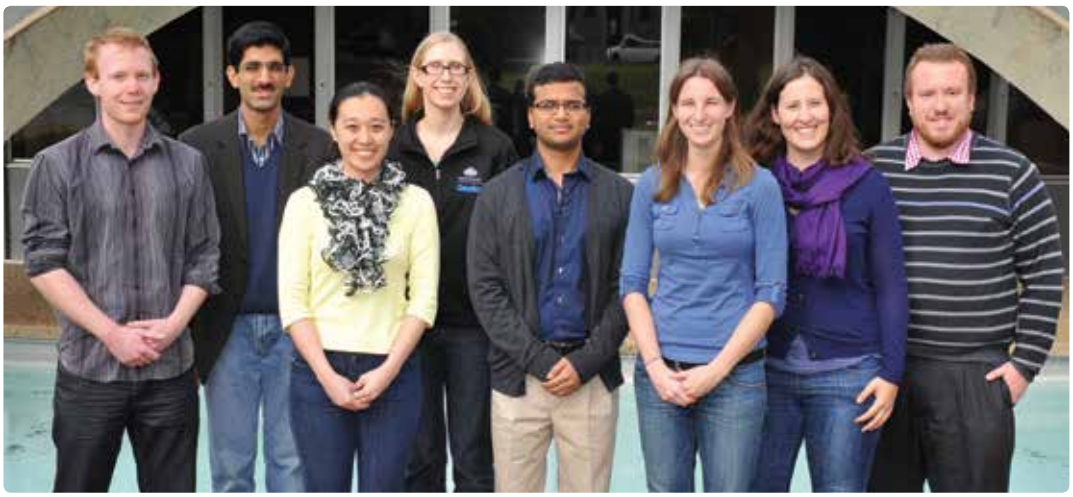
Furthering SIEF's commitment to fostering international standards and connection of Australian science, SIEF has initiated a prestigious new program this year in partnership with the Australian Academy of Science. The SIEF-Australian Academy of Science Fellowships to the Lindau Nobel Laureate Meetings provide a unique opportunity for young Australian researchers. The Lindau Meetings create a platform to facilitate encounters between Nobel Laureates and the world's best young scientists of tomorrow. It also provides the opportunity for young researchers to network with the elite of their peers from around the world. With SIEF's support, up to fifteen early career researchers per year will have this opportunity opened to them over the next seven years.

SIEF has never regarded geographical remoteness as an insurmountable barrier to science excellence. It also regards science as a key tool for the future economic prosperity of Australia. These ideals have been drawn together in a program under which students from remote or indigenous, and of low socioeconomic backgrounds are supported during their undergraduate science or engineering degrees. The inaugural Undergraduate Degree Scholars commenced in 2013 and will receive not only an ongoing stipend, but also academic and social support throughout their undergraduate degrees.

RESEARCH PROJECTS

This year saw the final round of grants awarded under SIEF's Research Projects Program, with the funding pool originally allocated to this Program largely committed. A total of 17 projects have been funded under this successful Program, and SIEF will be monitoring outcomes and impacts of these projects as they continue to progress and contribute benefits to the Australian community.

The Research Projects Program has committed a total of $77 million to over 35 research organisations, as a result of CSIRO's gift. The Program has promoted research in a cross section of scientific areas and contributed to a diverse spectrum of socioeconomic objectives. The early round Research Projects are coming to a conclusion, including the world-leading Australian Imaging, Biomarkers and Lifestyle (AIBL)2 longitudinal study of a cohort of older Australians to investigate the onset of Alzheimer's disease. It is one of the first studies to look at early detection of the disease and has attracted an increasing level of international funding over its life. The Project, a collaboration between CSIRO, Edith Cowan University, Melbourne Brain Centre at the University of Melbourne and the National Ageing Research Institute, has generated over 60 publications (more on page 37). This is one of the first of many projects whose outcomes are already fulfilling SIEF's primary objective of furthering the interests of the Australian community.



2013 recipients of the SIEF-Australian Academy of Science Fellowships to the Lindau Nobel Laureate Meetings. Image: Mark Graham, Australian Academy of Science

SIEF ADVISORY BODIES

My role as Trustee has been greatly assisted by the Fund's Advisory Council, Expert Panel and Undergraduate Scholarship Panel. The members of these bodies have loyally supported the Fund, many since its rejuvenation in 2009, and provide constant guidance and insight on a *pro bono* basis. My gratitude to these supporters of the Fund, both personally and on behalf of Australian science, is profound.

My thanks also extend to the many reviewers who generously give their time and expertise to assessing reports and applications for scholarships and fellowships. It is this spirit of generosity and goodwill within the Australian science community that has created the dedicated and thriving landscape in which SIEF operates today.

As the Fund develops maturity, I look forward to the year ahead as one characterised by an increasing abundance of results and outcomes from projects, scholarships and fellowships that have been initiated in previous years. The Advisory Council and I will maintain our focus on research infrastructure investments in the coming year, and through these investments our commitment to promote science of global significance, in the rich tradition of SIEF, continues.

Dr Megan Clark
Trustee SIEF

Advisory Council
Prof Alan Robson (Chair)
Prof Tom Spurling
Dr Ezio Rizzardo
Prof Margaret Sheil
Mr Nigel Poole

Expert Panel
Prof Tom Spurling
Dr Ezio Rizzardo
Dr Oliver Mayo
Prof John McKenzie
Prof Elaine Sadler
Dr Trevor Powell

Undergraduate Degree Panel
Prof Margaret Sheil (Chair)
Prof David Symington
Dr Terry Lyons

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 2013, which comprises: a Statement by the Trustee and Chief Finance Officer of the Commonwealth Scientific and Industrial Research Organisation; Statement of Comprehensive Income; Balance Sheet; Statement of Changes in Equity; Cash Flow Statement; and Notes to and forming part of the Financial Statements 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.

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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.

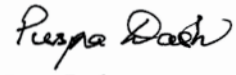
Opinion

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 2013 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 2013

SCIENCE AND INDUSTRY ENDOWMENT FUND

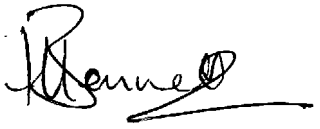
STATEMENT BY TRUSTEE AND CHIEF FINANCE OFFICER OF CSIRO AS SERVICE PROVIDER TO THE SCIENCE AND INDUSTRY ENDOWMENT FUND

In our opinion, the attached financial statements for the year ended 30 June 2013 have 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 2013 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 2013



Hazel Bennett
Chief Finance Officer of CSIRO as service provider to the Science and Industry Endowment Fund

21 August 2013

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF COMPREHENSIVE INCOME
For the period ended 30 June 2013

	Notes	2013	2012
		$	$
EXPENSES			
Scientific research grants	5	25,659,369	15,083,556
Gift fund services fees		466,090	496,050
Audit fees		7,000	7,000
Professional fees		-	4,415
Advertising and approval fees	6	4,873	4,961
Other fees		9,148	7,843
Total expenses		**26,146,480**	**15,603,825**
LESS:			
REVENUE			
Interest		6,540,473	8,694,011
Resources received free of charge	6	4,873	4,961
Total revenue		**6,545,346**	**8,698,972**
Net deficit		**(19,601,134)**	**(6,904,853)**
Other comprehensive income		-	-
Total comprehensive loss		**(19,601,134)**	**(6,904,853)**

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
BALANCE SHEET
As at 30 June 2013

	Notes	2013 $	2012 $
ASSETS			
Cash	7	121,612,429	140,705,328
Interest receivable	8	1,438,235	1,577,577
GST receivable		1,350,269	331,916
Prepayments		-	2,466
TOTAL ASSETS		**124,400,933**	**142,617,287**
LIABILITIES			
Payables			
Creditors		2,937,997	1,702,212
Accrued expenses	9	542,527	393,532
Total payables		**3,480,524**	**2,095,744**
TOTAL LIABILITIES		**3,480,524**	**2,095,744**
NET ASSETS		**120,920,409**	**140,521,543**
EQUITY			
Contributed equity		200,000	200,000
Retained surplus		120,720,409	140,321,543
TOTAL EQUITY		**120,920,409**	**140,521,543**

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 2013

	Retained Surplus		Contributed Equity		Total Equity	
	2013 $	2012 $	2013 $	2012 $	2013 $	2012 $
Balance as at 1 July	**140,321,543**	**147,226,396**	**200,000**	**200,000**	**140,521,543**	**147,426,396**
Net deficit	(19,601,134)	(6,904,853)	-	-	**(19,601,134)**	**(6,904,853)**
Closing balance at 30 June	**120,720,409**	**140,321,543**	**200,000**	**200,000**	**120,920,409**	**140,521,543**

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 2013

	Notes	2013 $	2012 $
OPERATING ACTIVITIES			
Cash received			
Interest received		6,679,815	7,899,168
Net GST received		1,572,687	1,580,824
Total cash received		**8,252,502**	**9,479,992**
Cash used			
Payments to grantees		26,828,181	15,120,858
Other payments		517,158	638,569
Bank fees paid		62	227
Total cash used		**27,345,401**	**15,759,654**
Net cash provided/(used) by operating activities	10	**(19,092,899)**	**(6,279,662)**
Net increase/(decrease) in cash held		(19,092,899)	(6,279,662)
Cash at the beginning of the reporting period		140,705,328	146,984,990
Cash at the end of the reporting period		**121,612,429**	**140,705,328**

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 STATEMENTS
For the period ended 30 June 2013

Note 1 Summary of Significant Accounting Policies

1.1 Basis of Preparation of the Financial Statements

The financial report is required by section 10 of the Science and Industry Endowment Act 1926 and is a general purpose financial report that has been prepared in accordance with Australian Accounting Standards, Australian Accounting Interpretations, and other authoritative pronouncements of the Australian Accounting Standards Board.

The financial statements have been prepared on an accrual basis and are 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 Balance Sheet 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 statements are 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 Balance Sheet Date

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 statements.

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 Science and Industry Endowment Fund is to provide assistance to persons engaged in scientific research and in the training of students in scientific research.

New Gift October 2009

In October 2009, Senator Carr announced a gift of $150 million to be donated by CSIRO to the Science and Industry Endowment 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

	2013 $	2012 $
BY TYPE		
Grants payable	54,990,428	35,936,867
Total grants payable	**54,990,428**	**35,936,867**
BY MATURITY		
One year or less	19,512,086	11,821,391
From one to five years	35,326,742	24,115,476
More than five years	151,600	-
Total grants payable	**54,990,428**	**35,936,867**

Note: Commitments are GST exclusive.

Note 4 Contingent Assets and Liabilitilies

No contingent assets and liabilities existed as at 30 June 2013 (2012: nil).

Note 5 Scientific research grants

CREST Program awards	18,529	31,141
Macquarie University joint chair in Wireless Communication	-	246,480
Scholarships and Fellowships	1,906,800	1,399,000
Research Infrastructure Investment	7,900,000	-
Special Research Program	2,500,000	-
Research Project Grants	13,334,040	13,406,935
Total	**25,659,369**	**15,083,556**

Note 6 Estimated value of resources provided free of charge by CSIRO are as follows:

– advertising and approval fees	4,873	4,961
Total	**4,873**	**4,961**

		2013	2012
Note 7	**Cash**	**$**	**$**
	Cash at bank	3,391,594	35,997
	Deposits – at call	118,220,835	140,669,331
	Total	**121,612,429**	**140,705,328**
Note 8	**Receivables**		
	Interest receivable	1,438,235	1,577,577
		1,438,235	**1,577,577**
	Gross receivables are aged as follows:		
	Not overdue	**1,438,235**	**1,577,577**
Note 9	**Accrued expenses**		
	Macquarie University joint chair in Wireless Communication	-	246,480
	Service fee under Services Agreement with CSIRO	120,883	108,911
	CREST Program awards	24,644	31,141
	Research Project Grant	390,000	-
	Audit fee	7,000	7,000
	Total	**542,527**	**393,532**
Note 10	**Cash Flow Reconciliation**		
	Reconciliation of operating surplus to net cash from/(used by) operating activities:		
	Operating surplus/(deficit)	(19,601,134)	(6,904,853)
	Changes in assets and liabilities		
	(Increase)/decrease in receivables	(879,011)	(752,910)
	(Increase)/decrease in prepayments	2,466	(2,466)
	Increase/(decrease) in payables	1,384,780	1,380,567
	Net cash from/(used by) operating activities	**(19,092,899)**	**(6,279,662)**

Note 11 Financial Instruments

11A: Categories of Financial Instruments	2013	2012
	$	$
Financial assets		
Cash	121,612,429	140,705,328
Interest receivable	1,438,235	1,577,577
Total financial assets	**123,050,664**	**142,282,905**
Financial liabilities		
Supplier payables	3,480,524	2,095,744
Total financial liabilities	**3,480,524**	**2,095,744**

The net value of the financial assets are their carrying amounts.

11B: Credit risk

SIEF is exposed to minimal credit risk as financial assets represent cash and short term deposits held at reputable Australian financial institutions and receivables from CSIRO. 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. SIEF has assessed the risk of default on payment to be nil as of 30 June 2013 (2012: nil).

11C: Liquidity risk

SIEF's financial liabilities are supplier payables. The exposure to liquidity risk is based on the notion that SIEF 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 (2012: nil).

11D: Market risk

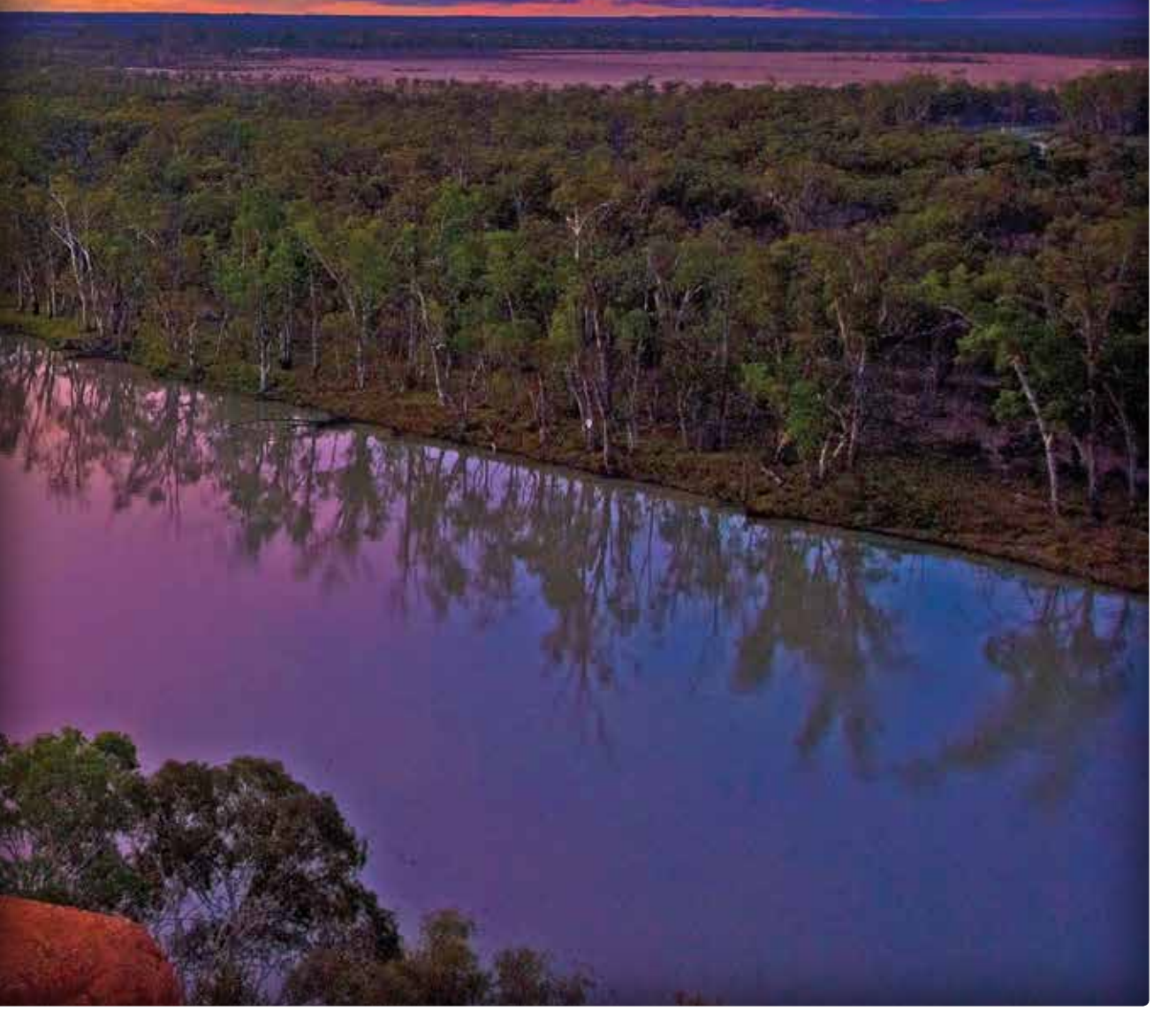
SIEF holds basic financial instruments that do not expose SIEF to any market, currency or other price risk (2012: nil).

11E: Interest rate risk

SIEF 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 2012–13 the average return on cash and short term deposits was 4.97% (2012: 5.88%).

MURRAY-DARLING BASIN • **ENHANCING WATER SECURITY IN THE MURRAY-DARLING BASIN**
Murray-Darling Sustainable Yields has saved an estimated $2.8 billion through better risk management.

PART SIX
INDEXES



Acronyms

AAHL	Australian Animal Health Laboratory
ACCESS	Australian Community Climate and Earth System Simulator
ADJR Act	*Administrative Decisions (Judicial Review) Act 1977*
AGP	Australian Growth Partnership
AIBL	Australian Imaging, Biomarkers and Lifestyle
ALA	*Atlas of Living Australia*
ANBCF	Australian National Biological Collections Facility
ANIC	Australian National Insect Collection
ANFC	Australian National Fish Collection
ANH	Australian National Herbarium
ANU	Australian National University
ANWC	Australian National Wildlife Collection
ASKAP	Australian Square Kilometre Array Pathfinder
ATNF	Australia Telescope National Facility
CAC Act	*Commonwealth Authorities and Companies Act 1997*
CDSCC	Canberra Deep Space Communication Complex
CO_2	Carbon dioxide
CRC	Cooperative Research Centre
CREST	Creativity in Science and Technology
CSIR	Council for Scientific and Industrial Research
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSS	Client satisfaction survey
EMC	Executive Management Council
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
ESD	Ecologically Sustainable Development
ESM	Enterprise Strategy Measure
ESS	Environmental Sustainability Strategy
ET	Executive Team
FCF	Flagship Collaboration Fund
FOI Act	*Freedom of Information Act 1982*
FTE	Full-Time Equivalent
GRDC	Grains Research and Development Corporation
HSE	Health, Safety and Environment
ICT	Information and communication technology
IP	Intellectual Property
KEA	Key Executive Action
KPIs	Key Performance Indicators
LTIFR	Lost Time Injury Frequency Rate
MISA	Marine Innovation Southern Australia
MNF	Marine National Facility
MTFR	Medical Treatment Frequency Rate
MRV	Marine Research Vessel
NGL	National Geosequestration Laboratory
NIS	National Innovation System
NRIP	National Research Investment Plan
PAPT	Patient Admission Prediction Tool
PBS	Portfolio Budget Statements
PCT	Patent Cooperation Treaty
R&D	Research and development
SAC	Strategic Advisory Committee
SIEF	Science and Industry Endowment Fund
SIR Act	*Science and Industry Research Act 1949*
SESKA	Sustainable Energy for the Square Kilometre Array
SKA	Square Kilometre Array
SMEs	Small-to-medium enterprises
TCPs	Transformation Capability Platforms
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 – 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 (e.g. 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 global peers: Applied science research organisations from around the world that are comparable to CSIRO include:

Abbreviation	Name	Country
ASTAR	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 (SIRIM)**	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.

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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*, in particular Part 2 of the *Commonwealth Authorities (Annual Reporting) Orders 2011* and the *Science and Industry Research Act 1949*. This annual report complies with Parliamentary standards of presentation and printing, and uses plain English and clear design.

CAC Act 1997 requirements	Source	Page
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)	2–106
The annual report includes financial statements prepared by the directors under clause 2 of Schedule 1.	Schedule 1 Clause 1(b)	112–169
The annual report includes the Auditor-General's report on the financial statements.	Schedule 1 Clause 1(c)	110–111
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	i
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).		i
The annual report complies with Parliamentary standards of presentation and printing.	Clause 8	210
The annual report uses Plain English and clear design.	Clause 9	210
Enabling legislation is specified, including a summary of its objectives and functions, as specified in its legislation.	Clause 10	88
The responsible Minister is specified.	Clause 11	88
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*		98
• *Freedom of Information Act 1982*		173
• *Equal Employment Opportunity (Commonwealth Authorities) Act 1997*		102
• *Work Health and Safety Act 2011*		95
• *Privacy Act 1988*		173
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	158–162
The annual report provides an outline of:	Clause 14	
(a) the organisational structure (including subsidiaries)		xii–xiii
(b) the location of major activities and facilities, and provides a statement on governance practices, including details on:		xiv
(a) board committees and their responsibilities		89–90
(b) education and performance review processes for directors		90–91
(c) ethics and risk management policies.		91–92
The annual report discloses the decision-making process undertaken by the Board in relation to transactions with other entities.	Clause 15	89–90

CAC Act 1997 requirements	Source	Page
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		89
(b) operational and financial results		3
(c) key changes to its status of affairs or principal activities		i
(d) amendments to enabling legislation or any other legislation directly relevant to its operation.		88
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	91
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	210
Science and Industry Research Act 1949	***SIR Act 1949***	
Policies relating to scientific research	Act No 84, Section 46, 51 (2a)	91
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Ministerial directions or guidelines relating to the functions and powers of the Board	Act No 84, Section 46, 51 (2d)	89
Policies of the Australian Government that apply to CSIRO	Act No 84, Section 46, 51 (2e)	91
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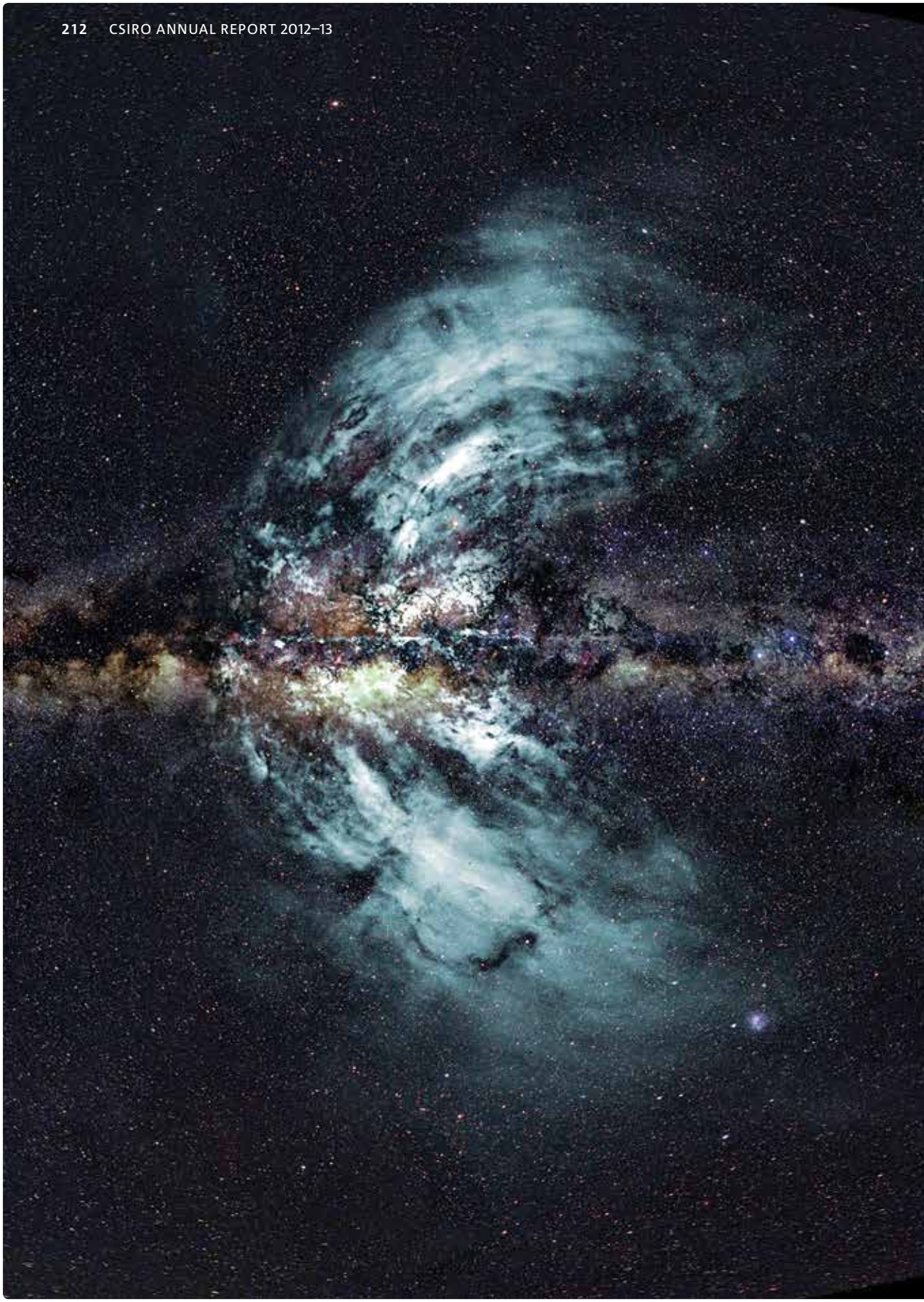

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