



CSIRO – the Commonwealth Scientific and Industrial Research Organisation – is one of the largest and most diverse scientific organisations in the world. It has around 6500 staff located across 55 sites throughout Australia and overseas.

CSIRO is an independent statutory authority constituted and operating under the provisions of the *Science and Industry Research Act 1949* and the *Commonwealth Authorities and Companies Act 1997*.

Our purpose states:

By igniting the creative spirit of our people, we deliver great science and innovative solutions for industry, society and the environment.

About this report

This CSIRO Operational Plan meets the requirements of section 35 of the *Science and Industry Research Act 1949*. It represents the annual implementation of the CSIRO five-year Strategic Plan. It 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. In fulfilling the above compliance requirements, the Operational Plan 2009–10 is also aligned with CSIRO's outcome statement, programs and performance information as presented in the Portfolio Budget Statements for 2009–10.

The report is available on the CSIRO intranet for staff access and on the internet for public access. This report can be viewed on the internet at: www.csiro.au/operational-plan

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Cover Images: Left – Preventative Health and Tasmanian ICT Project leader, Mr Dipak Bhandari, with the Weight Management Mentor. Photo: David McClenaghan. Top right – CSIRO's Dr John Wright at the launch of the post-combustion carbon capture plant at Munmorah Power Station in New South Wales. Photo: Delta Electricity. Bottom right – Future Manufacturing's Dr Scott Watkins holding a sample of the plastic solar cells produced during the print trials at Securency International. Photo: Tracey Nicholls

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CSIRO researcher Mr Guy Burnett discusses the sustainable urban renewal of East Lake in Canberra with Ms Alison Moore, from the ACT Planning and Land Authority. Photo: David McClenaghan

Foreword



Dr Megan Clark, Chief Executive

Over the past two years we have seen a significant increase in public awareness in relation to issues which threaten the continued progress of humankind on this planet. Triggered by climate change and the impact of carbon emissions from fossil-based energy sources, governments worldwide are responding and science and innovation are seen as critical to providing both solutions and advice on which to base informed policy.

Under Dr Geoff Garrett's leadership, CSIRO has organised itself internally and positioned itself externally to respond to Australia's challenges, but within the context of a much greater global overlay. We have built on our past, anticipating, focusing and growing the capability needed to deal with challenges such as water, energy, climate, the prevention of chronic lifestyle based disease and food security in a natural resource and carbon constrained world. These are complex challenges which require both multi-interdisciplinary research of scale and an integrated approach across CSIRO and the broader "innovation system".

I have found the 2007–11 CSIRO Strategic Plan to be resilient in the face of these challenges and to be a sound guide as to how the Organisation needs to change to respond to current and future challenges and opportunities. The previous two Operational Plans have been effective in translating this strategy in key areas.

This Operational Plan is the third under the overarching framework of the 2007–11 CSIRO Strategic Plan. We are half way through our strategic cycle and, as the incoming Chief Executive, it is timely to review how CSIRO is performing against our plan and consider its ongoing relevance in relation to a rapidly changing external environment, both nationally and globally.

Our 2009–10 strategy reaffirms our focus on these national challenges. In addition, we will sharpen our focus in future manufacturing and focus our energy research on carbon, clean fossil fuels and renewable energy. Recognising the increasing global importance of food security we will elevate our agricultural research on increasing total productivity while reducing our carbon footprint to Flagship status.

We reaffirm our critical national role in catalysing cross-disciplinary integration projects and will continue to build this capability to address what are both national and global challenges. We believe management of the national facilities and collections is a core role for CSIRO.

We have a robust Science Planning and Science Investment Process that we will continue to refine to ensure we prioritise the allocation of our resources and we have a clear path-to-impact and investment milestones. We will increase the impact of our Flagships by executing on our existing projects and developing a pipeline of projects with stakeholders out to 2020.

CSIRO's strength and resilience comes from our scale, the breadth and depth of our science and our national reach. We will continue to harness the power of being one organisation. We will continue to implement our strategy to deliver zero harm and increase our efforts

to ensure CSIRO has a neutral carbon footprint and decreased freshwater use.

Our CSIRO Compass Values have been developed with input from our teams and they will guide us as we continue on our journey.

It is not possible to achieve significant impact in cross-disciplinary research if we do not maintain and build our investment in our fundamental capability and our scientists have the very best training in their discipline areas. We will continue to invest in this area through our capability development funds in the Divisions, the Office of Chief Executive Science Excellence Scheme and the cross-Divisional Transformational Capability Platforms.

This Operational Plan provides a vision of a successful CSIRO, together with a set of values to guide our behaviour as we interact both inside our own Organisation and with our partners and stakeholders.

CSIRO has a deep well of scientific talent, a committed Board and capable management team and, together, we will move forward confidently as we tackle some of Australia's and the world's greatest challenges.

A handwritten signature in black ink that reads "Megan Clark".

Dr Megan Clark
Chief Executive

CSIRO Strategy and Objectives 2009–10



Michelle Sevell prepares samples of soy sauce for measurement of 3-mcpd – a chemical formed during the production of some flavour-enhancers. Photo: North Sullivan Photography

Our Strategy:

To grow our impact by delivering great science and innovative solutions for industry, society and the environment through:

- **National Research Flagships**
bringing focus and scale to research addressing some of Australia's most important and complex challenges and opportunities.
- **Core Research and Science**
providing advice, information, and solutions across the National Innovation System.
- **Science Outreach**
promoting the importance of science and its applications.
- **National Research Infrastructure**
managing national facilities and biological collections that underpin excellent science.



Our Compass:

• **Integrity of Science**

Embracing scientific excellence and working together ethically and with integrity in everything we do.

• **Trust and Respect**

Building trust and respect each day with our communities, collaborators, industry, research partners and colleagues.

• **Initiative to explore**

Taking the initiative to explore new horizons and taking responsibility to create an environment where innovation thrives.

• **Delivering on Commitments**

Consistently delivering on our commitments. 'Do what we say we will do.'

• **Safety and Sustainability**

Striving towards a healthy, safe and sustainable future.

Strategic Elements

Key Organisational Objectives

Delivering on national challenges

- Sharpen delivery through a focus on the goals and leadership of the National Research Flagships.
- Grow Flagship impact through partnerships with greater focus on global, national and small to medium enterprise partners.
- Increase the rigour and external ownership of CSIRO's Broad Direction Setting by more inclusive involvement of key National Innovation System Stakeholders.

Exploring / enhancing new horizons

- Increase CSIRO's capacity to explore 'New Horizon' science.
- Establish and nurture mechanisms to catalyse more interaction between CSIRO's diverse set of capabilities with a view to exploring novel science opportunities and applications.

Conducting science with impact

- Increase alignment of capability with our strategy and goals.
- Increase adoption of our science for national and global impact.
- Build enduring and meaningful partnerships across the NIS to ensure effective translation of CSIRO research into impact.

Harnessing One-CSIRO

- Implement strategies to deliver zero harm in the CSIRO workplace and a carbon neutral footprint for the Organisation.
- Create a consistent set of values across CSIRO which underpin a safe, innovative, responsive and collaborative working environment.
- Deliver strategies to ensure a resilient and sustainable Organisation.
- Develop 2011–15 Strategic Plan and approach to the 2011–15 Quadrennium Funding Agreement.

Building our people, capability and scientific excellence

- Establish an appropriate balance of investment between capability development and Portfolio delivery.
- Build effective workforce plans to ensure alignment of capability with strategy.
- Through new leadership, increase CSIRO's focus on the development and maintenance of national facilities and collections.

I.Your CSIRO

As Australia's national science agency, CSIRO is a powerhouse of ideas, technologies and skills for building prosperity, growth, health and sustainability.

We deliver research outcomes across the breadth of the National Research Priority agenda (Figure 1), and the National Innovation System (Figure 2).

Our roles in the National Innovation System

- Advancing frontiers of science / Managing national facilities and collections
- Generating new or significantly transforming industries
- Catalysing a scientific response to major national challenges
- Delivering incremental innovation for existing industries
- Science-based solutions for the community
- Science outreach and education/ Scientific publication and advice

Budget

CSIRO's 2009–10 budget is over \$1 billion, approximately 56 per cent from direct government appropriation and 44 per cent external revenue (including interest, royalties, sales of goods and services)

Figure 1: CSIRO's alignment to National Research Priorities

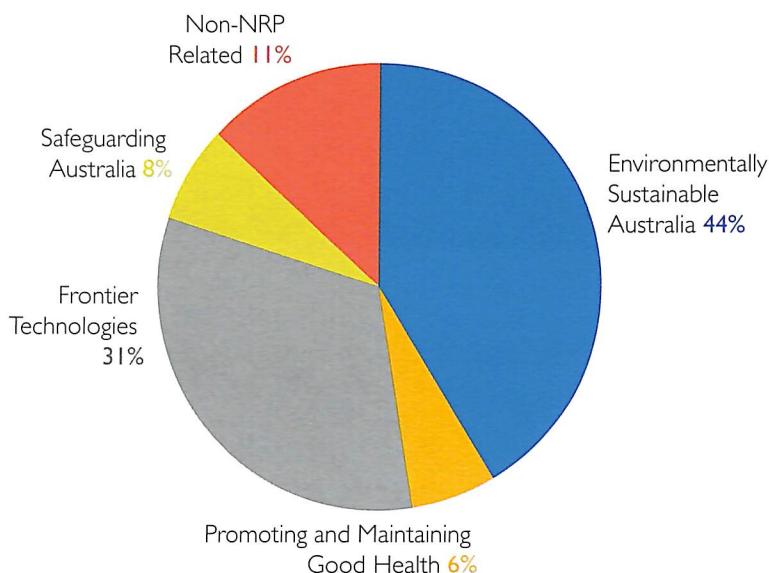
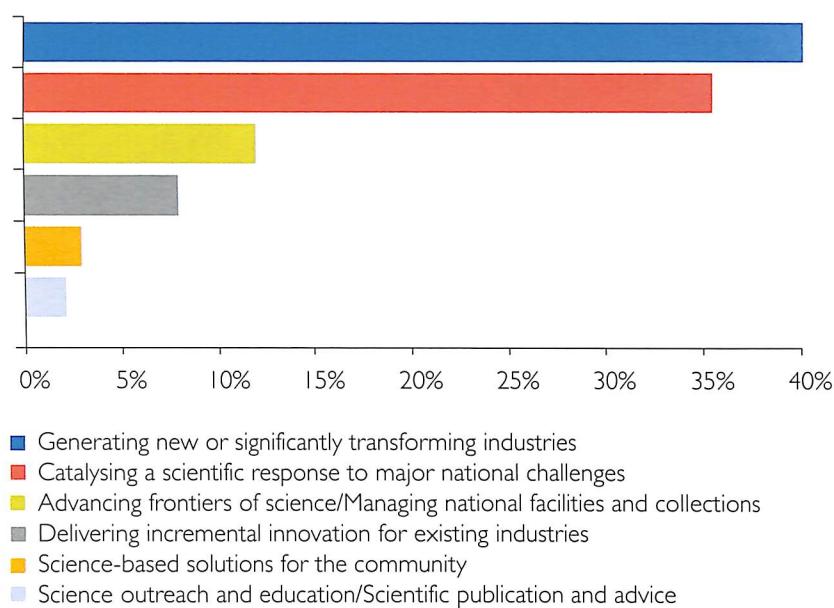


Figure 2: CSIRO's work allocation to National Innovation System roles



Dr Regg Benito undertakes adjustments on the Solar Thermal Dish at the Lucas Heights facility.
Photo: North Sullivan Photography

How CSIRO can work with you

For governments and their agencies, the CSIRO provides

- strategic and applied research in support of national and regional economic, social and environmental objectives.
- submissions to inquiries and working parties where scientific and technical advice is required.
- delivery of scientific and technological inputs to foreign trade missions and overseas aid projects.
- impartial policy advice based on expert knowledge and experience.

For organisations and individuals seeking scientific research expertise the Organisation:

- provides strategic coinvestment opportunities where industry and CSIRO funds are jointly applied to specific research projects with negotiated sharing of intellectual property.
- provides fee-for-service confidential scientific research undertaken for and on behalf of organisations, utilising CSIRO's considerable depth of unique expertise.
- provides testing, analytical and accreditation services based on specialised knowledge, staff and infrastructure.

CSIRO Strengths

Collaborative

- CSIRO works actively with partners and customers to develop and support relationships best suited to achieving mutual goals. We support our relationships in a range of ways including: partnering at strategic and transactional levels; the formation of multi-disciplinary customer teams; and dedicated account managers.
- CSIRO is the largest single participant in the Cooperative Research Centre (CRC) Program.

Differentiation-tackling complex problems

- CSIRO's strength lies in building expert teams to tackle complex problems. We have the breadth, skills, diversity, infrastructure, perspective and partners to deliver research outcomes of truly national significance and impact.

World-class science

- CSIRO ranks in the top one per cent of world scientific institutions in 14 out of 22 research fields from plant and animal sciences through to microbiology, materials science and environment and ecology (Essential Science Indicators, ISI, Thomson Reuters Scientific, June 2009).

Strong return on investment

- An independent assessment by ACIL Tasman found that a selection of CSIRO's activity in the 2004–07 triennium generated value for Australia many times greater than the resources invested in the Organisation.

Enterprising

- More than 20 spin-off companies created in the last six years.
- More than 160 active licenses of CSIRO innovation.

CSIRO Strengths

- | | |
|--------------------------------|--|
| Knowledge transfer | <ul style="list-style-type: none">• CSIRO transfers know-how through secondments, industry workshops, seminars and specialist publications.• CSIRO is Australia's leading patent filing enterprise, holding around 3710 granted or pending patents.• CSIRO currently supervises, co-supervises and/or sponsors over 770 PhD and MSc students. |
| Rigorous investment process | <ul style="list-style-type: none">• A combination of strategic and analytical processes (including transparent criteria) enables CSIRO to implement a systematic and deliberate approach to managing its investment portfolio. |
| Diversified research portfolio | <ul style="list-style-type: none">• CSIRO is involved in research in a broad range of areas including agriculture; the environment; information and communication technologies; health; advanced materials and manufacturing; minerals and energy; transport and infrastructure; and astronomy. |
| Global reach | <ul style="list-style-type: none">• Worldwide CSIRO is involved in over 700 current or recently completed research activities in 70 countries. The projects range from water to land mine detection, forestry to systems implementation.• CSIRO is part of the Global Research Alliance to leverage combined capabilities to target the United Nations' Millennium Development Goals in water, energy, health, transport and the digital divide.• CSIRO has published over 3500 joint publications with overseas researchers in the last five years. |
| Diverse business arrangements | <ul style="list-style-type: none">• Equity investment in publicly listed companies, unlisted companies, special purpose vehicle companies.• Membership or association interest in companies limited by guarantee.• Interest in incorporated joint venture, unincorporated joint ventures.• Participation in collaborative research arrangements. |



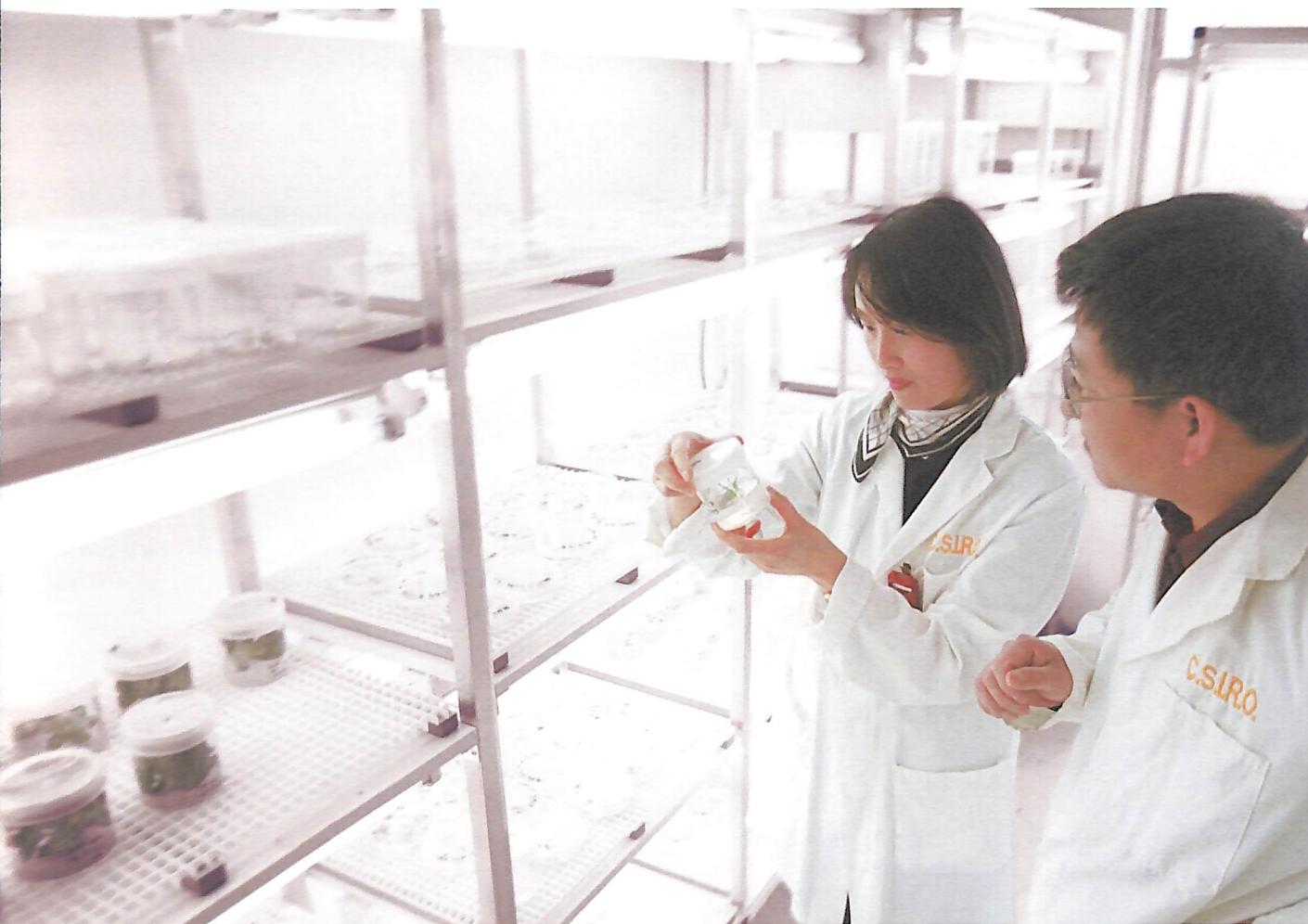
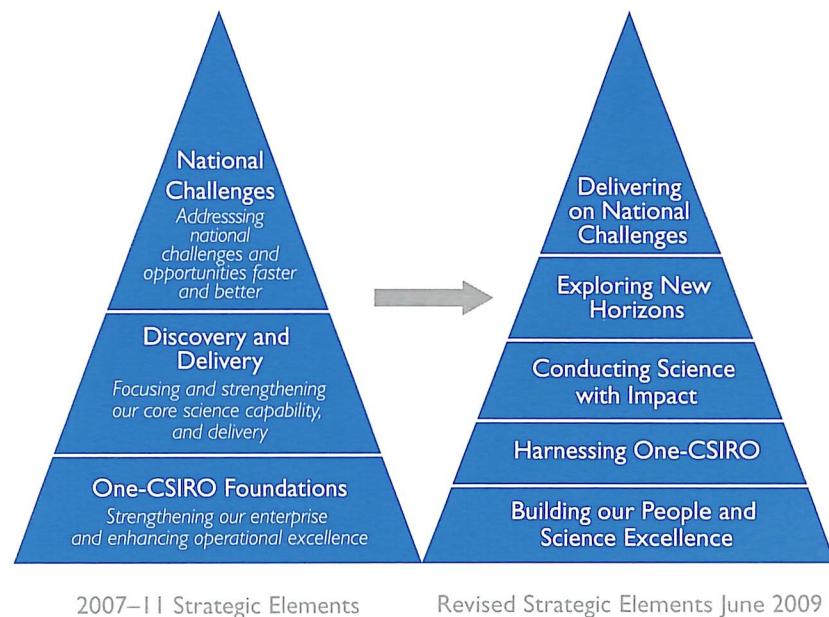
CSIRO's Dr Naomi McClure-Griffiths in front of the 64 metre Parkes Telescope. Photo: David McClenaghan

2. Strategy Review and Implementation

Early in 2009, the CSIRO Executive Team and Board undertook a mid-term review of CSIRO's Strategic Plan for 2007–11. This review confirmed that the strategy remains a robust guide for the Organisation, but identified the opportunity to adopt a more explicit articulation of the core elements of the strategy as shown in Figure 3.

To ensure that appropriate effort and attention is focused on putting the strategy into effect, this Operational Plan identifies a number of key organisational objectives and executive actions for 2009–10 that align with each strategic element (see following table).

Figure 3: CSIRO's Strategic Elements



CSIRO's Dr Ming-Bo Wang looks on as researcher Limin Luu assesses seedlings immunised against Barley Yellow Dwarf Virus at Canberra's Black Mountain Laboratories. Photo: North Sullivan Photography

Key Organisational Objective	Key Executive Actions
Strategic Element: Delivering on National Challenges	
Sharpen delivery through a focus on the goals and leadership of the National Research Flagships.	<ul style="list-style-type: none"> • Establish a new Flagship addressing agricultural productivity and food security in a resource/carbon constrained world. • Reposition the Energy Domain to respond to key National and State initiatives, specifically refocusing the Energy Transformed Flagship on alternative energy research. • Undertake external Flagship Reviews to provide an independent assessment of Flagship delivery against goals.
Grow Flagship impact through partnerships with greater focus on global, national and SME partners.	<ul style="list-style-type: none"> • Executive Director, Development, to work with Flagship Directors to define a ten year pipeline of large, collaborative, programs, focused on the delivery of Flagship goals (Pipeline 2020).
Increase the rigour and external ownership of CSIRO's Broad Direction Setting by more inclusive involvement of key NIS stakeholders.	<ul style="list-style-type: none"> • Establish the National Broad Direction Setting Project.
Strategic Element: Exploring New Horizons	
Increase CSIRO's capacity to explore 'New Horizon' science.	<ul style="list-style-type: none"> • Increase funding to New Horizon science through: <ul style="list-style-type: none"> - Capability Development Funds - Science Excellence Scheme - Transformational capability platforms.
Establish and nurture mechanisms to catalyse more interaction between CSIRO's diverse set of capabilities with a view to exploring novel science opportunities and applications.	<ul style="list-style-type: none"> • Continue to invest in and develop activities which enhance creative new approaches to science: <ul style="list-style-type: none"> - Transformational capability platforms - Wider communities of practice - Less conventional partnerships.
Strategic Element: Conducting Science with Impact	
Increase alignment of capability with our strategy and goals.	<ul style="list-style-type: none"> • Implement and continue to refine the One-CSIRO Science Planning and Review program to monitor science, deliver performance and prioritise investment.
Increase adoption of our science for national and global impact.	<ul style="list-style-type: none"> • Finalise and roll out path-to-impact analysis model developed in Preventative Health to other Flagships.
Build enduring and meaningful partnerships across the NIS to ensure effective translation of CSIRO research into impact.	<ul style="list-style-type: none"> • Position CSIRO as a differentiated leader in carbon modelling, marine research and clean/green technologies, and develop engagement strategies to catalyse/mobilise NIS responses in these areas. • Reposition CSIRO's Communications function to provide more integrated support in conducting science with impact.

Key Organisational Objective	Key Executive Actions
Strategic Element: Harnessing One-CSIRO	
Implement strategies to deliver zero harm in the CSIRO workplace and a carbon neutral footprint for the Organisation.	<ul style="list-style-type: none"> • Implement Human Resources, Safety and Sustainability strategy focusing on: <ul style="list-style-type: none"> - a <i>zero harm</i> safety environment - Sustainable energy use, carbon neutral Organisation.
Create a consistent set of values across CSIRO which underpin a safe, innovative, responsive and collaborative working environment.	<ul style="list-style-type: none"> • Develop and embed a 'Compass' for charting CSIRO's values and behaviours.
Deliver strategies to ensure a resilient and sustainable organisation.	<ul style="list-style-type: none"> • Implement key 'lever' work streams and Simplification Project to optimise structures, roles, policies and standards for greater operational efficiency and effectiveness. • Develop processes to explicitly align capital priorities with science strategy. • Leverage national infrastructure opportunities, specifically National Collaborative Research Infrastructure Strategy and Education and Investment Fund, to establish strong capability partnerships. • Execute Pipeline 2020 Project. • Establish an effective business model framework to guide appropriation investment in research collaborations.
Develop 2011–15 Strategic Plan and approach to the 2011–15 Quadrennium Funding Agreement.	<ul style="list-style-type: none"> • Commence an integrated campaign in the second half of 2009 to communicate CSIRO's value in the National Innovation System.
Strategic Element: Building our People and Scientific Excellence	
Establish an appropriate balance of investment between capability development and Portfolio delivery.	<ul style="list-style-type: none"> • Define and manage targets for: <ul style="list-style-type: none"> - direct funding into capability - performance standards and metrics.
Build effective workforce plans to ensure alignment of capability with strategy.	<ul style="list-style-type: none"> • All Business Units to develop capability development and succession plans.
Through new leadership increase CSIRO's focus on the development and maintenance of national facilities and collections.	<ul style="list-style-type: none"> • Recruit a senior leader to manage National Collections overseen by CSIRO. • Develop policy on CSIRO's role in the management of National Facilities.

3. Investing for Impact

Outcome Domains

CSIRO has identified a number of broad outcome domains (Figure 4) to which CSIRO will deliver research outputs based on CSIRO's strengths in chosen areas of science relevant to each of these domains. Often through working in partnership with others, we expect to see new breakthroughs and discoveries in the coming year and we expect to deliver important and tangible benefits to Australian society. Figure 4 provides an indication of our current focus and the connections across these outcome domains. The size of the ellipses reflects approximate investment at this stage.

CSIRO's Mr Chris Skourtis, chemical engineer, examines a petri dish of raw carbon nanotubes.

Photo: Bea Lipson



Science Investment Process

CSIRO invests in science and support projects through a systematic and robust science investment process that increases linkages across the Organisation, builds on our distinctive cross-disciplinary strengths and encourages a longer-term perspective towards science planning.

Science investment decisions are based on the criteria of **relevance** and **impact**.

Relevance criteria establish that:

- the proposed investment is appropriate to our roles in the broader innovation system and aligned with Australia's National Research Priorities
- CSIRO has the capability to tackle the research challenge
- science and technology is a key component of the solution to the problem.

Impact criteria establish that:

- there is an identifiable pathway for research outputs to be taken through to delivery and adoption
- the investment represents a productive application of scarce resources
- CSIRO is competitive in the delivery of this research output and an efficient and effective provider in the research field.

The key steps in the science investment process include:

Broad direction setting –

An annual examination and re-calibration of our longer-term strategy and current research portfolio and capability development initiatives. It considers advice from internal and external sources and changes to the internal and external environment.

It provides guidance to the Organisation on the direction and timing of investment shifts, the specific role CSIRO should play, and the science and capability areas requiring additional investment.

Enterprise level balancing

– An examination and balancing of portfolio and capability priorities from an enterprise-wide perspective.

Performance and investment appraisals

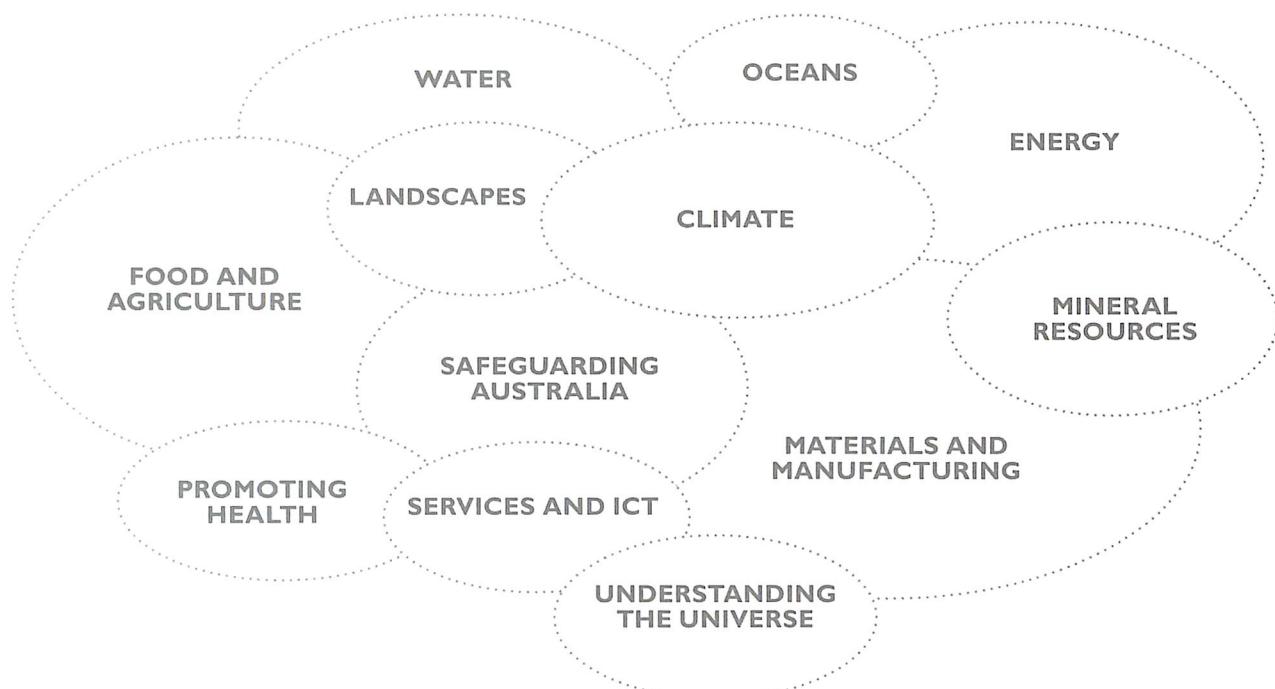
– A rolling program of portfolio and capability (Divisional) appraisals that monitor progress and assess the level of ongoing investment in research Themes and capability development initiatives.

Broad Directions for 2009–10

CSIRO's broad science directions are outlined in the current 2007–11 Strategic Plan. For the 2009–10 financial year, CSIRO will strengthen research directions in five areas:

- Strengthen our world-class environmental research with particular emphasis on water, climate change and carbon.
- Direct our world-class marine capability to deliver oceanographic, geo-scientific, fishery and ecosystem research and ensure vital integration between ocean, land and atmosphere research, including climate change.
- Build underpinning capability platforms in transformational biology, advanced materials, sensor network technologies and computational and simulation sciences, and use e-enabled technologies to conduct our research.
- Combine environmental sustainability expertise with research into agricultural

Figure 4: CSIRO Outcome Domains



productivity, leading to higher-value agricultural products and increase our research intensity into food production and food security.

- Focus our research in health, including the relationships of food with nutrition.

CSIRO research is funded in research themes. The level of investment in each theme, as decided through the science investment process described above, is shown in the tables which follow in Section 4. Delivery of theme outputs and outcomes is dependent on investment in, and deployment of, CSIRO capabilities (Section 5).

CSIRO also invests in a number of enterprise functions that provide critical support to the development of research capability and the delivery of theme outputs. These include the provision of support services such as laboratory management, finance and accounting, property management,

payroll and human resources, communications, procurement, legal and contract administration services, intellectual property management and management of IT systems. Also critical is the development and communication of effective strategy and governance processes. These help to guide CSIRO staff in fulfilling their duties, focus key management decisions and nurture valuable relationships with key stakeholders.



4. CSIRO Programs

CSIRO's Outcome and Programs

As set out in the Portfolio Budget Statements (PBS) 2009–10¹, CSIRO has a single Outcome statement supported by four Programs (Figure 5). Key performance indicators for each program as stated in the PBS, are listed on pages 13–19.

National Research Flagships (Program 1) and Core Research and Services (Program 2) represent the majority of CSIRO's appropriation. These two programs are the key mechanisms for undertaking strategic and applied research to benefit industry, the environment and the community.

The National Research Flagships are distinct from Core Research and Services in that they are generally larger, multi-disciplinary responses with longer time-frames that are targeted to major challenges and opportunities of national or global significance.

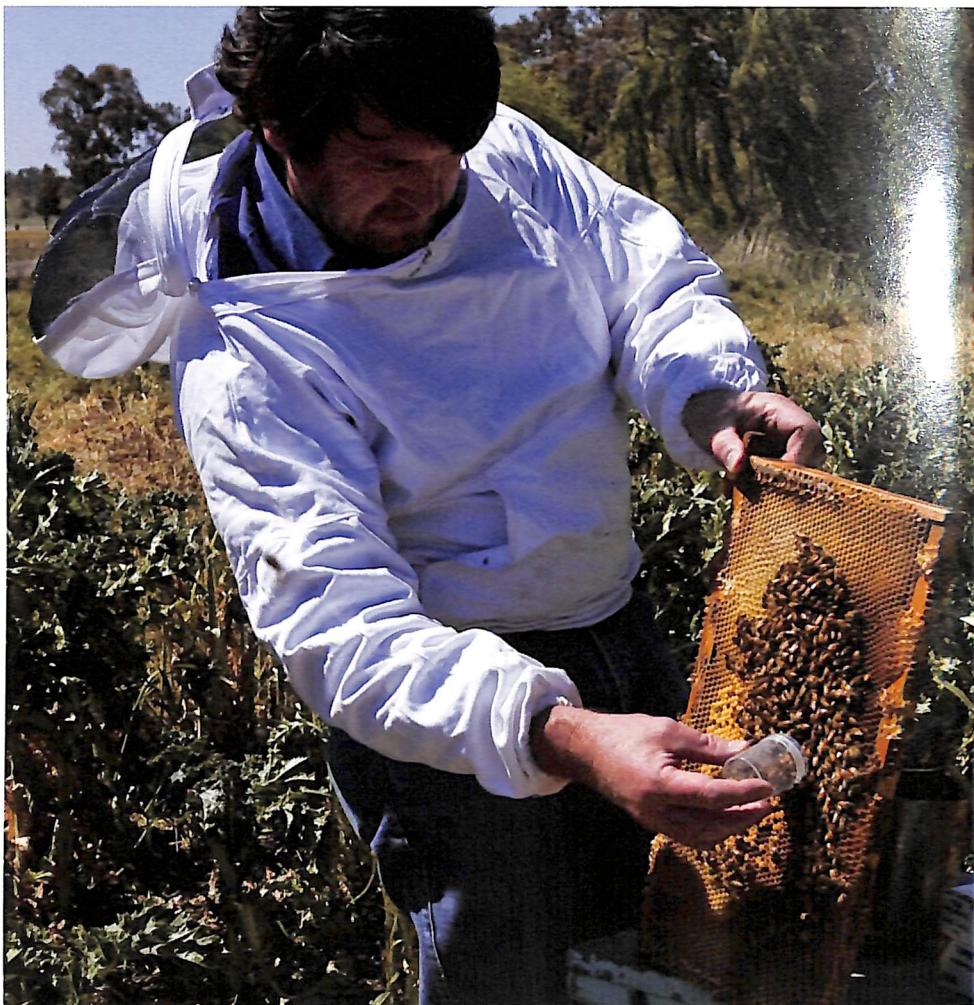
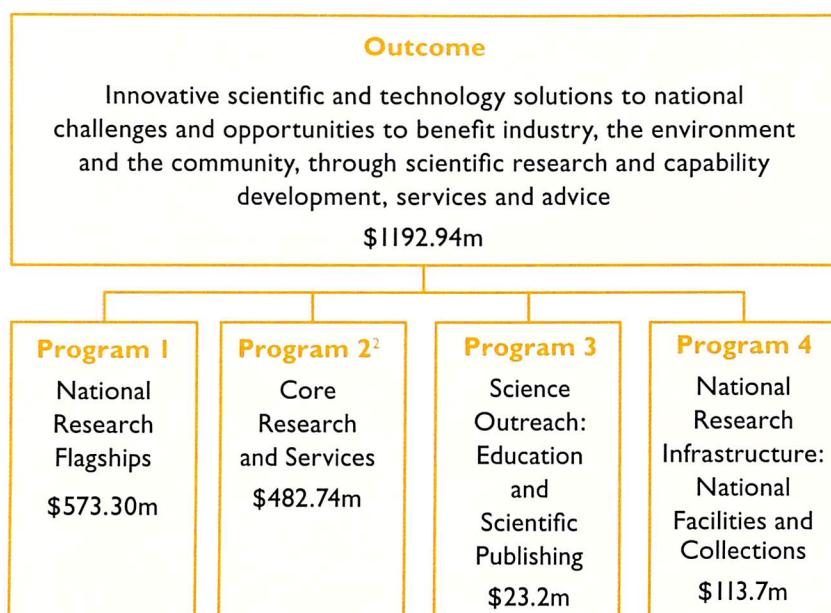
Together, National Research Flagships and Core Research aim to provide benefits to industry, environment and community in the order of \$20 billion by 2015 increasing to \$150 billion by 2030.

Science Outreach (Program 3) and **National Research Infrastructure** (Program 4) complement and enhance the impact of Programs 1 and 2. In addition to the direct value they generate for Program users, they are of major importance in building Australia's long-term capability and capacity to perform science and generate scientific solutions.

¹ CSIRO's entry in the Portfolio Budget Statements can be accessed at: www.innovation.gov.au

2 Program 2 includes direct investments in capability development.

Figure 5: CSIRO Outcome-Program Structure



CSIRO's Dr Denis Anderson collecting bees from a hive at a cherry farm near Young, New South Wales. Photo: Nick Pitsas.

Program 1: National Research Flagships

The National Research Flagships program addresses major national challenges and opportunities through large-scale multi-disciplinary research partnerships. One of the largest research endeavours ever undertaken in Australia, Flagships extend traditional models of science to deliver scientific solutions to advance Australia's most pressing national objectives.

Flagships target clearly defined goals, framed from a deep analysis of the needs of people and enterprises. Flagships operate on a large-scale and long timeframes, and have a strong focus on impact and adoption.

Recognising that complex challenges require collaboration of the best and brightest researchers, the Flagships form partnerships with universities and publicly funded research institutions, the private sector and selected international organisations.

Each Flagship is managed under the leadership of a Research Group Executive (more detail is found on page 16) and a Flagship Director. Ten Flagships will be operational in 2009–10.

Agribusiness Group

- **The Sustainable Agriculture Flagship (SA)** aims to secure Australian agricultural and forest industries by increasing productivity by 50 per cent and reducing net carbon emissions per unit of food and fibre by at least 50 per cent between 2009–10 and 2030.

- **The Food Futures Flagship (FF)** aims to transform the international competitiveness of, and add \$3 billion annually to, the Australian agrifood sector by the application of frontier technologies to high-potential industries.
- **The Preventative Health Flagship (PH)** aims 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 disease.

Energy Group

- **The Energy Transformed Flagship (ET)** aims to halve greenhouse gas emissions and double the efficiency of the nation's new energy generation, supply and end use.
- **The Wealth from Oceans Flagship (WfO)** aims to position Australia by 2020 as an international benchmark in the delivery of economic, social and environmental wealth based on leadership in understanding ocean systems and processes.

Environment Group

- **The Climate Adaptation Flagship (CA)** aims to equip Australia with practical and effective adaptation options to climate change and variability and in doing so create \$3 billion per annum in net benefits by 2030.
- **The Water for a Healthy Country Flagship (WfHC)** aims to provide Australia with solutions for water resources management, creating economic gains of \$3 billion per annum by 2030, while protecting or restoring our major water ecosystems.

Manufacturing, Materials and Minerals Group

- **The Future Manufacturing Flagship (FM)** aims to create new or significantly transform existing high value-adding, export-oriented sectors to improve the future competitiveness of Australian manufacturing delivering \$3 billion of impact by 2020.
- **The Light Metals Flagship (LM)** aims to lead a global revolution in light metals, doubling export income and generating significant new industries for Australia by the 2020s while reducing environmental impact.
- **The Minerals Down Under Flagship (MDU)** aims to assist the Australian minerals industry to exploit new resources with an in-situ value of \$1 trillion by the year 2030, and more than double the size of the associated services and technology sector to \$10 billion per year by 2015.

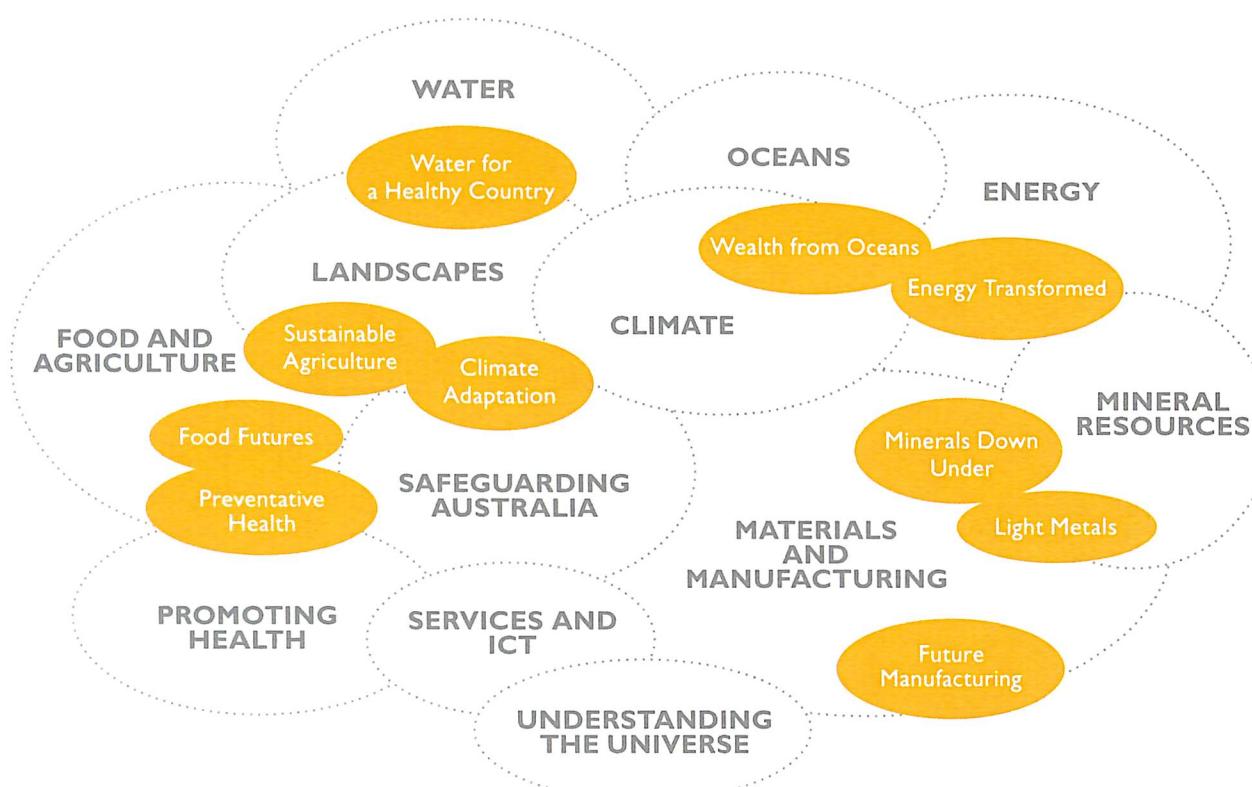
Figure 6 on page 14 shows the major areas of alignment between each Flagship and CSIRO's outcome domains.

National Research Flagships: Key Performance Indicators³

- Evidence of growing economic, social, environmental and intangible benefits through demonstrated adoption of Flagship outputs
- Maintain or increase the number of refereed publications
- Maintain or increase financial support by Flagship partners
- Maintain customer satisfaction
- Investment of the Flagship collaboration funds as per agreed guidelines

³ KPI as stated in 2009–10 PBS

Figure 6: Alignment of Flagships to CSIRO Outcome Domains



National Research Flagship Activities 2009–10

Portfolio	Theme #	Theme Name
AGRIBUSINESS GROUP		
	I020	Future Grains – Grain Based Foods and Feed
Food Futures \$49.2m	I021	Breed Engineering
	I022	Designed Food and Ingredients
	I023	Quality Biosensors
	I025	Colorectal Cancer and Gut Health
Preventative Health \$42.4m	I026	Neurodegenerative Disease, Mental Disorders and Brain Health
	I146	Obesity and Health
	I179	Greenhouse Gas Abatement and Carbon Storage in Land Use Systems
Sustainable Agriculture \$69.0m	I180	Advancing Agricultural Productivity and Environmental Health
	I181	Landscape Systems and Trends
	I182	Partnering for International Food and Fibre Security

Portfolio	Theme #	Theme Name
ENERGY GROUP		
Energy Transformed \$66.2m	I016	Energy Futures
	I017	Low Emission Electricity
	I018	Low Emission Transport
	I019	Low Emissions Distributed Energy
Wealth from Oceans \$80.3m	I064	The Dynamic Ocean: Building Foundations for Climate, National Security and Sustainable Marine Industries
	I065	Blue GDP: Ocean Based Industry Development and Growth
	I177	Our Resilient Coastal Australia
	I178	Sustainable Ocean Ecosystems and Living Resources
ENVIRONMENT GROUP		
Climate Adaptation \$42.5m	I155	Pathways to Adoption
	I156	Sustainable Cities and Coasts
	I157	Managing Species and Natural Ecosystems
	I158	Adaptive Primary Industries, Enterprises and Communities
Water for a Healthy Country \$99.0m	I006	Urban Water
	I010	Integrated Water Information System
	I136	Healthy Water Ecosystems
	I137	Regional Water
MANUFACTURING, MATERIALS AND MINERALS GROUP		
Future Manufacturing \$33.8m	I090	Flexible Electronics
	I169	Nanosafety
	I175	Biomedical Manufacturing
	I176	Clean Technology
Light Metals \$38.2m	I000	Aluminium and Magnesium Manufacturing
	I001	Alumina
	I002	Aluminium
	I003	Magnesium
	I004	Titanium
Minerals Down Under \$52.7m	I160	Discovering Australia's Mineral Resources
	I161	Transforming the Future Mine
	I162	Securing Australia's Future Ore Reserves
	I163	Driving Sustainable Processing Through Systems Innovation

4 Energy Group will be restructured in 2009–10

Program 2: Core Research and Services

CSIRO's core research and services activities improve industry, the environment and community wellbeing. They do this by providing the advice, information and solutions, new and improved technologies, management systems, intermediate and final products, and services for business.

CSIRO's research and services are managed and delivered through Research Groups. Each Group is led by a Group Executive who has broad responsibility for nurturing the development of a range of research capabilities and for their deployment to a number of research 'Themes' which each have an explicit purpose to provide benefit to Australia.

There are five Research Groups:

The **Agribusiness Group** serves large and vital sectors of the Australian economy including the agri-food and fibre industries, and the human health sector. The Group's objectives are to enhance the global competitiveness and sustainability of agribusiness industries and to improve human wellbeing and community health by performing world-class and strategic research. The Group also carries responsibility for policy oversight of biotechnology/bioeconomy, including regulation of gene technology research.

The **Energy Group** aims to develop and apply leading-edge energy research that meets Australian needs. It encompasses both community and industry driven research and is important for government policy development, for producing technologies for industry, and for meeting societal needs for knowledge and practical solutions to the wider energy sustainability challenge.

The Group looks at the ways in which the processes of generation and consumption of energy and power can be made more efficient and better for the environment. It seeks to deliver science and solutions vital to maintaining a globally competitive and sustainable Australian energy industry, and is providing Australia with a key capacity to discover, protect and realise the benefits of our ocean territories.

The **Environment Group** aims to support the development of production sectors while at the same time minimising current and potential adverse environmental impacts. Australians have stewardship of a beautiful, diverse and unique environment. The cumulative consequences of the last 200 years of development of natural resources leaves us with a legacy of environmental challenges juxtaposed with opportunities for new economies for Australia that address the triple bottom line imperative.

CSIRO's Environment Group is responding to these challenges and opportunities by providing systems understanding, developing and applying new technologies and supporting our clients, partners and stakeholders in carefully balancing economic development with ecological conservation.

The **Information Sciences Group** contains the core of CSIRO's research focus in the sectors of astronomy, information communication technology and mathematical and statistical services.

The aims of the operational units in the Group are to: understand the universe and its origins; develop globally applicable technologies to respond to genuine needs in the ICT and service domains; and develop innovative technologies and

services through mathematical and information sciences research and prototypes.

The **Manufacturing, Materials and Minerals Group** contains the core of CSIRO's research focus in the materials, manufacturing, minerals, mining, chemicals, health and infrastructure sectors. The focus of the operational units in the Group is to: stimulate and support the creation of sustainable value from Australia's minerals resources over the full market value chain; maximise value to the manufacturing sectors by developing and transferring innovative transformational technologies; and develop new materials and products for application in the health and chemical industries.

Core Research and Services: Key Performance Indicators⁵

- Evidence of growing economic, social, environmental and intangible benefits through demonstrated adoption of Core Research outputs
- Maintain or increase the number of refereed publications
- Maintain customer satisfaction

⁵ KPI as stated in 2009–10 PBS

Portfolio	Theme #	Theme Name
ENERGY GROUP⁴		
Energy Transformed \$66.2m	I016	Energy Futures
	I017	Low Emission Electricity
	I018	Low Emission Transport
	I019	Low Emissions Distributed Energy
Wealth from Oceans \$80.3m	I064	The Dynamic Ocean: Building Foundations for Climate, National Security and Sustainable Marine Industries
	I065	Blue GDP: Ocean Based Industry Development and Growth
	I177	Our Resilient Coastal Australia
	I178	Sustainable Ocean Ecosystems and Living Resources
ENVIRONMENT GROUP		
Climate Adaptation \$42.5m	I155	Pathways to Adoption
	I156	Sustainable Cities and Coasts
	I157	Managing Species and Natural Ecosystems
	I158	Adaptive Primary Industries, Enterprises and Communities
Water for a Healthy Country \$99.0m	I006	Urban Water
	I010	Integrated Water Information System
	I136	Healthy Water Ecosystems
	I137	Regional Water
MANUFACTURING, MATERIALS AND MINERALS GROUP		
Future Manufacturing \$33.8m	I090	Flexible Electronics
	I169	Nanosafety
	I175	Biomedical Manufacturing
	I176	Clean Technology
Light Metals \$38.2m	I000	Aluminium and Magnesium Manufacturing
	I001	Alumina
	I002	Aluminium
	I003	Magnesium
	I004	Titanium
Minerals Down Under \$52.7m	I160	Discovering Australia's Mineral Resources
	I161	Transforming the Future Mine
	I162	Securing Australia's Future Ore Reserves
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Core Research and Services Activities 2009–10

Portfolio	Theme #	Theme
AGRIBUSINESS GROUP		
Entomology \$26.2m	I077	Invasive Species and Plant Biosecurity
	I080	Building Bioindustries with Synthetic Biology
Food and Nutritional Sciences \$17.1m	I030	Transforming Food Manufacture
	I032	Enhancing Food Benefit and Safety
Livestock Industries \$44.8m	I044	Transforming Animal Biosecurity
	I045	Transforming the Animal and its Products
	I038	New Horizons in Plant Science
	I039	Delivering Quality Crops for Consumer Choice and Improved Industry Competitiveness
Plant Industry \$70.2m	I040	Plant Fibre and Biofactories for New Agricultural and Industrial Products
	I041	Designing Crops and Pastures for Australian Environmental Challenges
ENERGY GROUP⁶		
Energy Technology \$11.9m	I140	Secure and Sustainable Energy Technologies
Petroleum Resources \$16.7m	I092	Maximising Australia's Oil Self-sufficiency
ENVIRONMENT GROUP		
Marine and Atmospheric Research \$28.4m	I132	Climate and Atmosphere
INFORMATION SCIENCES GROUP		
Astronomy \$8.9m	I068	Technologies for Radio Astronomy
	I069	Astrophysics
ASKAP \$9.2m	I070	ASKAP: The Australian Square Kilometre Array Pathfinder
Digital Technologies and Services \$27.3m	I057	eHealth
	I059	Broadband Wireless for Connecting Australia
	I183	Services Oriented Systems
MANUFACTURING, MATERIALS AND MINERALS GROUP		
Exploration and Mining \$16.9m	I115	Maximising the Value of Mining
	I036	Advanced Fibrous Materials
Materials, Science and Engineering \$44.4m	I103	Advanced Engineered Components
	I104	Sustainable Polymeric Materials
	I106	Industrial Research Services

⁶ Energy Group and Manufacturing, Materials and Minerals Group will be restructured in 2009–10

Portfolio	Theme #	Theme
Minerals \$25.5m	I053	Iron Ore-Maximising Export Marketability
	I054	High-Performance Mineral Processes for Australia
	I055	Instrument Systems for On-Line Analysis
Molecular Health Technologies \$38.7m	I048	National Security Technology Partnerships
	I088	Australian Biotech Growth Partnerships
	I089	Biomedical Materials

Program 3: Science Outreach – Education and Scientific Publishing

Through the science outreach programs CSIRO aims to promote the importance of science and its application to students, parents, teachers and the Australian community. This work contributes to the maintenance of Australia's science capacity, which helps Australia to remain innovative and competitive in science.

CSIRO is strongly positioned 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 supports undergraduates, post-graduates and post-doctoral researchers to boost the calibre of researchers working in the Australian community. CSIRO gives young

researchers experience in technology transfer and uptake, 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, the plant and animal sciences, and environmental management.

Science Outreach: Key Performance Indicators⁷

- Utilisation of Science Outreach Programs (number of participants and users, proportion of uptake within the target group)
- Awareness of Science by CSIRO Stakeholders
- Evidence of success of participants in the Science Outreach programs (qualitative indicator-results are expected in narrative form)
- Continue to grow the international reach and impact for the 25 Journals published in partnership with the Australian Academy of Science and other societies
- Add 50 new book titles to the wide-ranging backlist of over 1200 publications targeting both Australian and international readers
- Positive net profit outcome from CSIRO Publishing.

Science Outreach Activities 2009–10

Theme #	Theme Name
I151	Discovery Centre
I153	CSIRO Education Programs
I154	CSIRO Publishing

⁷ KPI as stated in 2009–10 PBS

Program 4: National Research Infrastructure – National Facilities and Collections

CSIRO hosts National Research Infrastructure on behalf of the scientific community. There are two types of National Research Infrastructure:

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

The three National Research Facilities hosted by CSIRO are the:

- Australian Animal Health Laboratory (AAHL)
- Australia Telescope National Facility (ATNF)
- Marine National Facility MRV *Southern Surveyor* (MNF).

National Biological Collections 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. The major National Biological Collections are the:

- Australian National Insect Collection
- Australian National Wildlife Collection
- Australian National Fish Collection
- Australian National Herbarium.

National Research Infrastructure: Key Performance Indicators⁸

- | | | |
|--|--|---|
| <ul style="list-style-type: none"> • Utilisation of the National Research Infrastructure (the number of loans, visitor days, research days, observation time or operation time) • All National Research Infrastructure maintained and operated to international standard (qualitative indicator) | <ul style="list-style-type: none"> • Proportion of Collections digitised and available to the public (per cent of collection) • Coverage of the National Biological Collections (per cent of known species) • Demonstrated response to national events (this is a qualitative indicator - narrative responses are expected) | <ul style="list-style-type: none"> • Demonstrated high-quality scientific contributions in support of National Research Flagships, CSIRO Core Research and external users (this is a qualitative indicator - narrative responses are expected) • The AAHL Collaborative Biosecurity Research Facility is built and operated in accordance with the NCRIS/CSIRO agreement (this is a qualitative indicator - narrative response is expected) |
|--|--|---|

National Research Infrastructure Activities 2009–10

Theme #	Theme Name
I047	Diagnosis Surveillance and Response
I067	Australia Telescope National Facility Operations
I083	Canberra Deep Space Communication Complex Facility Management
I099	Marine National Facility
I173	Building Resilient Australian Biodiversity Assets

⁸ KPI as stated in 2009–10 PBS

5. CSIRO Capabilities

The quality of CSIRO's research is critical to the Organisation's reputation and impact. CSIRO must therefore continue to develop and maintain high-quality research capabilities (including world-class scientists and facilities and collaborative relationships).

Divisions are the 'home' of CSIRO research staff and facilities. Their primary role is to develop, maintain and deploy CSIRO's world-class research capabilities. In addition to managing professional development, staff succession and staff wellbeing, Divisions are responsible for deploying staff and resources to Themes that support the achievement of outcome goals funded through CSIRO's science investment processes. Individual Themes and projects regularly draw on staff and resources from one or more Divisions and develop research capability through challenging research. Divisions are jointly responsible for the development of 103 research capabilities, listed in the following table.

In addition to capability development funded through the investments in research

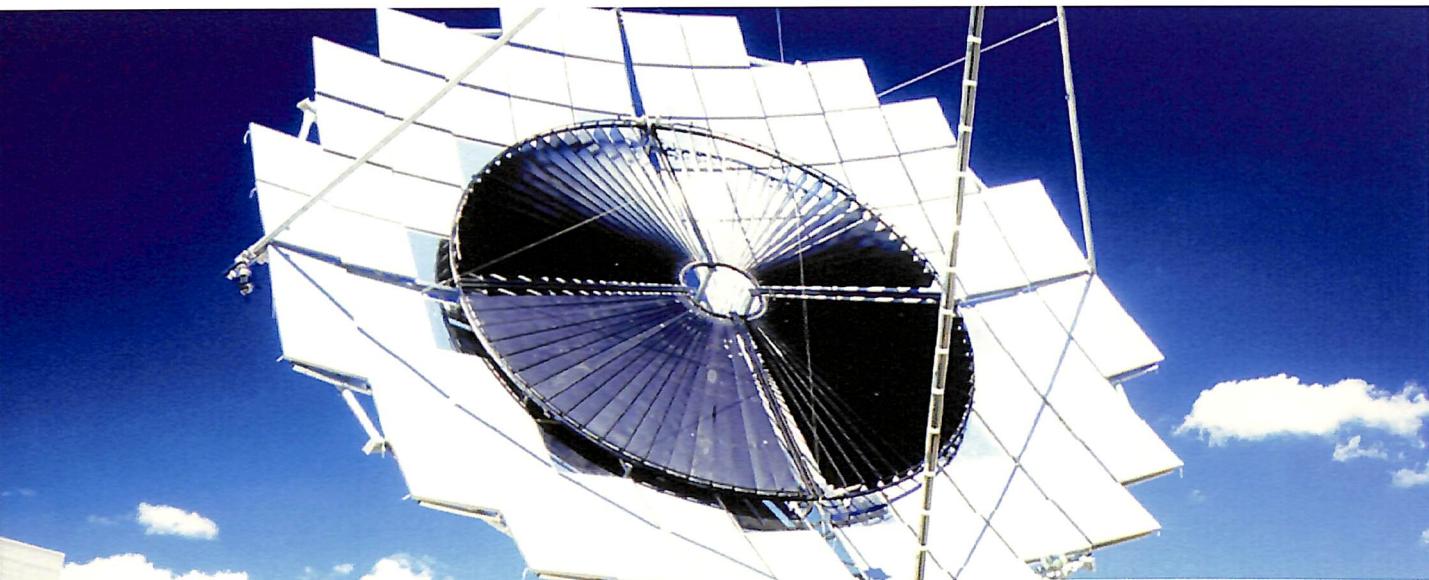
Themes, there are additional direct investments in capability development at both the Division and whole-of-enterprise levels. Direct capability investments in 2009–10 will account for around 11 per cent of research investment, including:

- **Transformational Capability Platforms (TCP)** which aim to ensure the long-term sustainability and future impact of the Organisation by strengthening key cross-organisational groups of capabilities. Direct investment in each TCP will enable a step change in CSIRO's research capabilities on a scale and scope beyond what is possible for any single Division. There are four TCPs: transformational biology, advanced materials, computational and simulation science, and sensors and sensor network technologies.
- **Divisional Capability Development Funds (CDF)** which are designed to provide Divisions with greater flexibility to explore opportunities to initiate new capability areas or to extend existing capabilities into new areas of potential impact.

In addition, the **Science Team program** encourages, promotes and supports science excellence through development of scientists and communication of science.

Capabilities: Key Performance Indicators⁹

- Maintain or improve science excellence in CSIRO research capabilities as assessed through a rolling program of rigorous peer review and measured by the proportion of capabilities rated as strong or benchmark.
- A CSIRO average of at least 1.5 publications per research scientist per year; with at least 40 per cent of journal publications in top-quartile-journals; and CSIRO citations per paper at least ten per cent above the world rate in all research fields; and total CSIRO citations per paper for all research fields at least 40 per cent above the world rate.



The solar thermal dish combines the sun's energy with natural gas to produce a syngas containing hydrogen for use in powering gas turbines and industrial processes. Photo: CSIRO

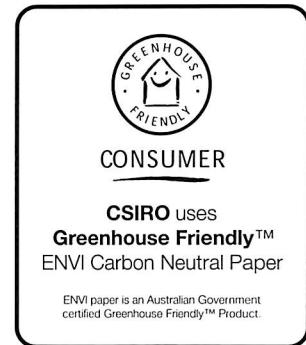
⁹ Internal CSIRO KPI

CSIRO Capabilities

Group and Division	Capability Name	Staff (FTE)
AGRICULTURE GROUP		
Entomology	Invertebrate Genomics and Evolution	44
	Australian National Insect Collection	34
	Invasional Biology and Functional Ecology	80
	Enzymology and Synthetic Biology	48
Livestock Industries	Animal Biology and Development	6
	Livestock Environmental Systems	37
	Bioindustry Product Development	27
	Animal Genomics and Genetic Analysis	40
Plant Industry	Microbial Biology and Metagenomics	13.5
	Pathogen Characterisation	25
	Emergency Disease Preparedness	65
	Modulation of Host Response	51.5
Food and Nutritional Sciences	Systematics, Collections and Information Management	37
	Conservation Biology and Sustainable Agricultural Production and Forestry Systems	61
	Irrigated Field Crop Improvement	42
	Horticultural Production Systems	16
Energy Group	Cereal Crop Improvement	40
	Australian Mediterranean-zone Cropping Systems	27
	Horticultural Crop Improvement	34
	Plant Host-Pathogen Interactions	28
Energy Technology	Plant Metabolic Engineering	56
	Tropical and Sub-Tropical Plant Biology	64
	Plant Genomics	64
	Food Chemistry and Bio Functionality	36.5
Petroleum Resources	Nutritional Genomics	13.4
	Process Engineering Science	20.9
	Food Materials Science	22.3
	Genomics	24.9
Energy Technology	Food Microbiology and Safety	31.7
	Health and Sensory Science	27.1
	Preclinical and Clinical Health Substantiation	42.4
	Renewable Energy, Management and Storage	82
Petroleum Resources	Low Emissions Fossil Fuels	76
	Petroleum Geoscience	79
	Petroleum Engineering	57

Group and Division	Capability Name	Staff (FTE)
ENVIRONMENT GROUP		
	Environmental Earth Observation	24
	Environmental Information Systems	36
	Soil and Landscape Science	46
	Surface Water Hydrology	43.1
	Groundwater Hydrology	34
Land and Water	Catchment Biogeochemistry and Aquatic Ecology	45
	Contaminant Chemistry and Ecotoxicology	45.6
	Water Reuse	16
	Environmental Process Engineering	22
	Urban Water Systems Engineering	27.7
	Atmosphere and Land Observation and Assessment	53
	Marine Ecological Processes and Prediction	97
	Marine Biogeochemistry	30
	Ocean Observation, Assessment and Prediction	53
Marine and Atmospheric Research	Earth System Modelling	31
	Weather and Environment Prediction	14
	Climate Variability Change	46
	Integrated Marine and Coastal Assessment Management	83
	Aquaculture Genetics, Nutrition and Production	24
	Social and Economic Science	95
	Forest and Agricultural Systems	91.2
Sustainable Ecosystems	Urban Science, Engineering and Technology	38.4
	Ecology of Terrestrial Systems	91.2
INFORMATION SCIENCES GROUP		
	Radio Telescope Operations	46
Australia Telescope National Facility	Radio Science and Engineering	73
	Astronomy and Astrophysics	23
	Tasmanian ICT Centre	35
	Wireless Technologies	49
	Autonomous Systems	49
Information Services	eHealth	38
	Information Engineering	39
	Networking Technologies	35
	Envionmental Information	46
Mathematical and Information Sciences	Quantitative Bioscience	38
	Computational Mathematical Modelling	23
	Business and Services Analytics	38

Group and Division	Capability Name	Staff (FTE)
MANUFACTURING, MATERIALS AND MINERALS GROUP		
	Mineral and Environmental Sensing	22
	Ore System Science	16
	Regolith Geoscience	16
Exploration and Mining	Mining Automation	23
	Mining Systems	35
	Mining Geoscience	33
	Computational Geoscience	30
	Metallic and Ceramic Materials	44
	Fluid Dynamics	22
	Superconductivity and Magnets	26
	Materials Performance	22
	Polymers	26
Materials Science and Engineering	Wave Physics	42
	Surface Coating	38
	Integrated Nano-Science	28
	Fibre Engineering	14
	Fibre Physics	25
	Fibre Chemistry	25
	Forest Fibre Science	8
	Fluids Process Modelling	16
	High-Temperature Processing	25
	Alumina Hydrometallurgy	28
Minerals	Mineral Processing and Agglomeration	34
	On-line Analysis and Control	28
	Materials Characterisation	26.5
	Process Engineering	31
	Precious and Base Metals Hydro Metallurgy	32
	Functional Small Molecules	32
	Protein Expression Modelling and Structure	36
Molecular and Health Technologies	Molecular and Cell Biology	38
	Functional Polymers	46
	Supramolecular Materials and Interfaces	61



CONSUMER

**CSIRO USES
Greenhouse Friendly™
ENVI Carbon Neutral Paper**

ENVI paper is an Australian Government certified Greenhouse Friendly™ Product.

Cover: Printed on Revive Silk Cover. Made from 25% post consumer and 25% pre consumer recycled fibre. It also contains elemental chlorine free pulp derived from sustainably managed forests and non-controversial sources. It is manufactured by an ISO 14001 certified mill.

Text pages: Printed on ENVI Coated. Made from elemental chlorine free pulp derived from sustainably managed forests and non controversial sources. It is certified carbon neutral and Australian Paper is ISO 14001 certified

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Your CSIRO

Australia is founding its future on science and innovation. Its national science agency, CSIRO, is a powerhouse of ideas, technologies and skills for building prosperity, growth, health and sustainability. It serves governments, industries, business and communities across the nation.