CSIRO

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Building Momentum for Impact

CSIRO Operational Plan 2010–11

Your CSIRO

CSIRO – the Commonwealth Scientific and Industrial Research Organisation – is one of the largest and most diverse scientific research organisations in the world. It has around 6,600 staff located across 56 sites throughout Australia and overseas.

We undertake scientific research into practically all aspects of human activity and its interaction with natural and built environments. This research includes our air and water; our diverse landscapes; oceans and climate; agriculture; energy; health; space technologies and exploration; manufacturing; materials science; minerals exploration and processing; information and communication technologies and more.

We seek to make a difference with our research and generate impact for Australia. We apply our knowledge to create jobs, national wealth, a healthy environment and improved living standards for all Australians.

Our role in Australia's National Innovation System is unique due to our size, our breadth and depth of capability, and our ability to conduct large-scale, multidisciplinary research focused on tackling major challenges that matter to Australia's future. Over 90 per cent of our research directly addresses the Australian Government's National Research Priorities.

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 four 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 these compliance requirements, the Operational Plan 2010–11 is also aligned with CSIRO's outcome statement, programs and performance information presented in the CSIRO Budget Statements for 2010–11.

This report is not intended to contain any legally binding representation.

Availability

The report is available on the internet for public access, see **www.csiro.au/operational-plan**

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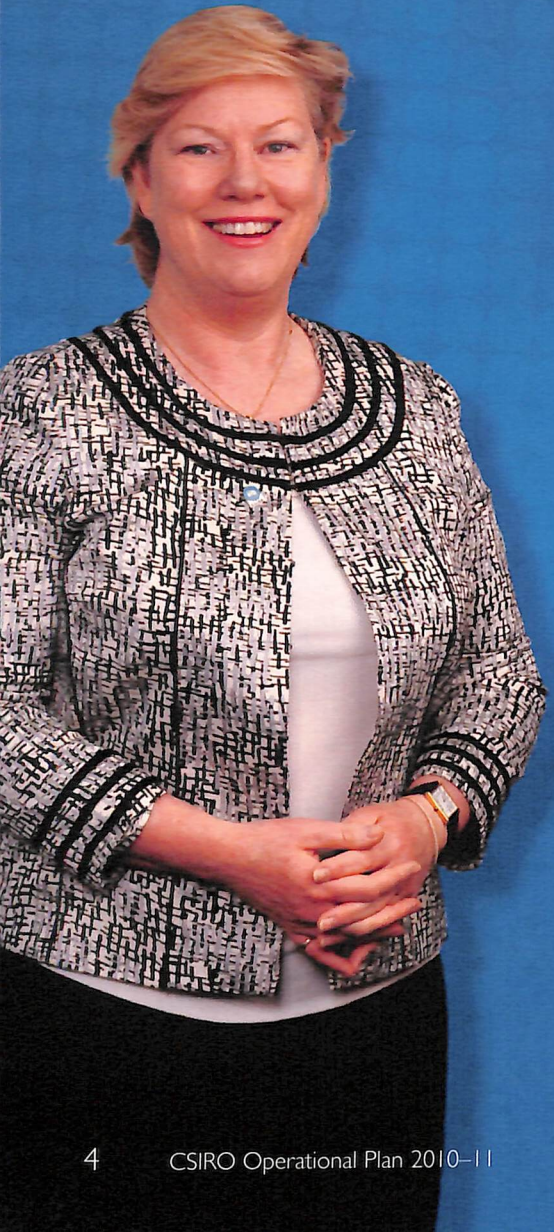
Foreword

This Operational Plan is the fourth and final under the overarching framework of the 2007–2011 CSIRO Strategic Plan.

The Plan builds on the foundations laid down since 2002 to grow our impact, and serves as a bridge between CSIRO's Strategic Plan 2007–2011 and CSIRO's journey during 2011–2015 to become a research enterprise with global reach. 2009 –10 has seen a number of significant achievements in CSIRO and milestones we have reached.



Looking back over the past year, CSIRO continued to build on its remarkable track record of success by making a positive impact on the social, environmental and economic wellbeing of the nation. We have seen the value to our stakeholders and partners reflected in a record number of active licences for our innovations, a record level of co-investment, consulting and services income and a record level of research activity. We have also responded quickly at home and around the globe to events such as biosecurity threats and food security issues.

CSIRO is firmly focused on the challenges that face the nation. It is respected as one of the top ten applied research organisations in the world. Our Flagship model and the ability to bring together the brightest and best minds to work on the major challenges that face this nation is being emulated by other major research organisations. In 2010–11 we will continue to strengthen and focus the efforts on our National Research Flagships. Our foresighting work has confirmed the importance of sharpening our focus on energy research, food security, water, health, and communications and information systems.

If we are to address these challenges and remain competitive in a world that is increasing its investment in innovation, we must maintain national and global-level science capability. We will invest in building the capability and infrastructure required to deliver a world-class response and ensure we have the platforms and investment in new horizons that will prepare us for the future.

CSIRO has a clear sense of its role in the national innovation system, and over the next 12 months we will complete the mapping of our national footprint and how we can work with other research organisations to build national and global critical mass and capability. CSIRO has a core role in managing national science facilities. In the next year, we will deliver on the milestones for the Australian Square Kilometre Array Pathfinder for international astronomy research, the *Atlas of Living Australia* to document the country's flora and fauna, and a new National Marine Research Vessel to learn more about our oceans.

In 2010–11 we will continue to build external partnerships, improve our commercial practices and our ability to deliver impact. We will continue to lift our efforts to communicate our positive impact to all Australians.

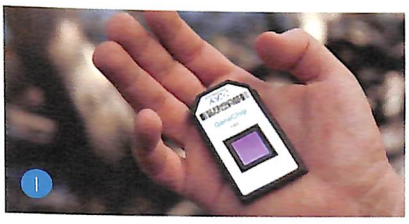
The coming year will see us complete our four-year strategy to 2015 and our funding agreement with the government. We will continue to ensure we can deliver large scale mission-directed research through our Flagships and ensure our Divisions can deliver excellent science and build capability and platforms for the future.

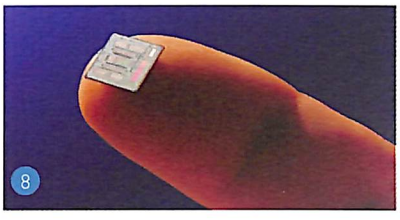
At the heart of our achievements and goals are our people. We must continue to use the scale and breadth of CSIRO and work as one organisation. Our CSIRO Values Compass will guide our interactions with our colleagues and external partners and stakeholders. They show us what we can expect from each other and others can expect from us. We continue to improve our health and safety performance and we will continue to take some bold steps towards achieving our goals of being carbon neutral and reducing our fresh water usage. I will be sponsoring our leadership training and we will build the training we offer in defining pathways to impact and commercial skills that befit an organisation whose "DNA" is science with impact.

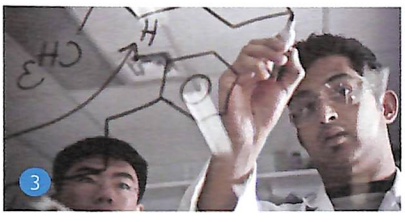
The pride that Australians feel for CSIRO is reflected in our passion for what we do and what we aim to achieve. We should all be proud to be part of this great organisation, where we strive every day to make a difference and have a positive impact on the issues that matter to this nation and humanity.

Dr Megan Clark
Chief Executive

CSIRO's Recent Achievements







1 Biodiversity chip

CSIRO has developed a new portable gene chip which can identify the presence of thousands of organisms in one sample. Using the chip, scientists can investigate what types of organisms are present in coastal sediments, providing valuable insight into the biodiversity and health of ecosystems.

2 Disease resistant cotton

CSIRO has developed cotton varieties with improved disease resistance that effectively combat serious diseases. These varieties comprise over 95 per cent of the Australian cotton crop.

3 RAFT technology

RAFT, a breakthrough polymer technology, provides a pivotal source of new materials for applications that include: intelligent drug delivery; paints and coatings to meet stricter environmental guidelines; targeted personal care and cosmetics; synthetic rubbers for improved performance; additives to promote fuel efficiency; and ink jet media.

4 Salt tolerant wheat

In a world first, CSIRO researchers have bred a variety of salt tolerant durum wheat which performs 25 per cent better than regular durum wheat in salty conditions. This means farmers in salt affected regions can improve the productivity and value of crops.

5 Zero emissions house

CSIRO and its partners have created the first affordable home for the average Australian family to have a zero emissions footprint. This eight-star energy efficiency rated home has been designed for a high-volume market and to be affordable for most middle-income families.

6 Massive telescope capacity formed

Six radio telescopes across Australia and New Zealand have joined forces linking up over 5,500 kilometres to act as one giant telescope. The linked telescope can make images ten times more detailed than those of the Hubble Space Telescope.

7 A sustainable water future for Australia

The most comprehensive and systematic studies of water availability in Australia's major water systems underpin policies and management strategies for a sustainable water future.

8 Wireless local area networks

In the early 1990s, CSIRO scientists invented and patented a solution to the problem of radio waves bouncing off walls and furniture indoors. This invention is at the heart of most commonly used high speed wireless local area networks (WLAN) used to connect computers and other devices to each other. To date over a billion devices have been sold worldwide incorporating CSIRO's WLAN technology.

9 Total wellbeing diet

The CSIRO Total Wellbeing Diet has gained the confidence of thousands of Australians as they improve their health through better diet and exercise.

Strategic Foundations

The way we work together to achieve the purpose and functions of CSIRO

CSIRO Strategic Plan 2007–2011

The Strategic Plan defines how we will achieve our core purpose over a four-year period. The current Plan is the second in our 20 year strategic journey from 2000–2020. The government holds us accountable for achieving our strategy. The Strategic Plan is founded on five strategic elements.

Delivering on National Challenges

We form partnerships to address national challenges and opportunities through our Flagships.

Exploring New Horizons

We continuously extend and develop our science capabilities, promoting excellence in science delivery and shaping future research directions.

Conducting Science with Impact

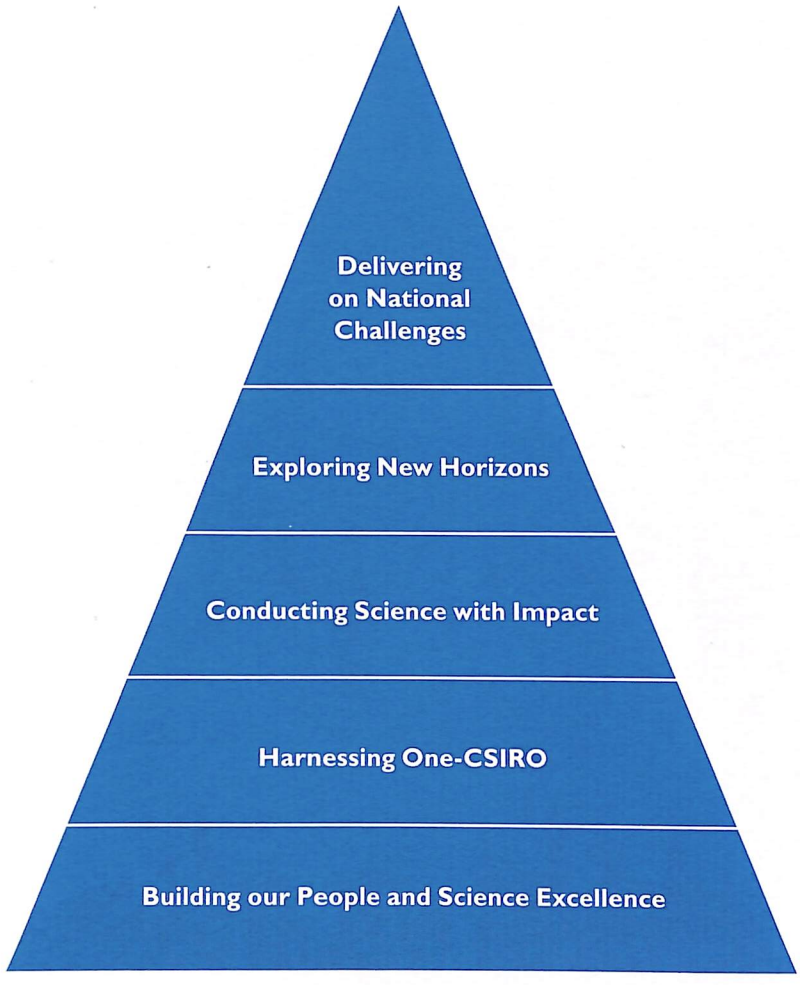
We deliver impact for Australia through transformational science, better business practices, accelerated adoption of our solutions and enhanced communication.

Harnessing One-CSIRO

We work together in an innovative, collaborative, values and performance-based environment. Our systems, structures and processes support the enterprise and ensure that our people remain healthy, safe and productive.

Building our People and Science Excellence

We ensure a balance between developing our capability and delivering outcomes from science. We manage facilities and collections for national benefit.

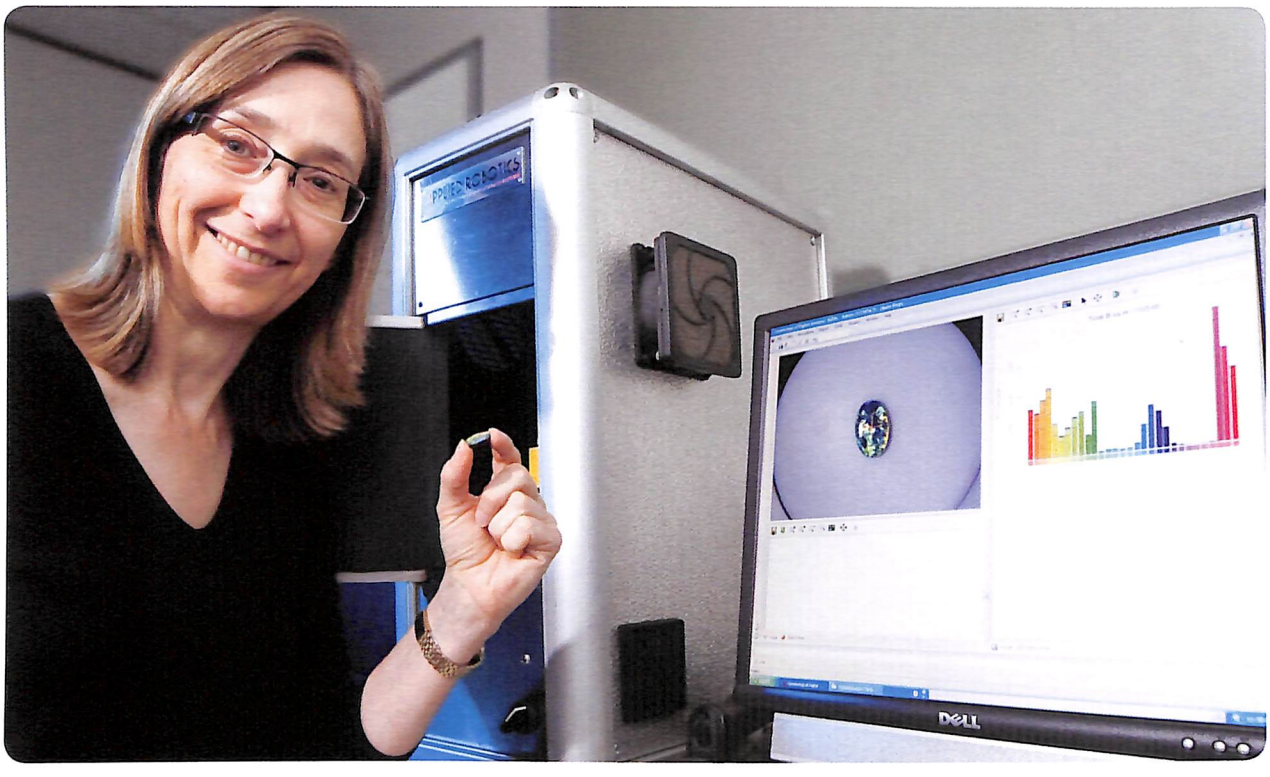


Strategy Implementation

The core of CSIRO's 2007–2011 strategy is articulated in the five strategic elements described on the previous page. To put the strategy into effect in this final year of the current strategic planning period – and to position the Organisation for successful transition to the 2011–2015 strategy – CSIRO's leadership team has identified the following high priority areas of focus for executive action in 2010–11.

Strategic Element	Key Executive Actions
1. Delivering on national challenges	
2010–11 Focus Further refine CSIRO's portfolio of research addressing national challenges and opportunities and contribute to the development of national research capacity.	1.1 Strengthen oversight of the National Research Flagships, their goals and focus, particularly in the food/health, sustainable agriculture and manufacturing/ metals domains. 1.2 Establish large scale demonstrations of low-emission energy technologies with external partners and support Australia's bid to host the Square Kilometre Array (SKA) international telescope. 1.3 Fulfil CSIRO's commitments to the development of the Australian SKA Pathfinder, the replacement Marine National Facility, the *Atlas of Living Australia* and the Pawsey High-Performance Computing Centre. 1.4 Identify a portfolio of options to grow CSIRO's future reach and impact.
2. Exploring new horizons	
2010–11 Focus Invest in building the capability and infrastructure required to deliver world-class responses to meet future needs.	2.1 Implement approved new horizon Science and Industry Endowment Fund (SIEF) projects, foster transformational capability platforms and build new horizon science capability, particularly at the food-health and minerals-metals-manufacturing intersections. 2.2 Clarify areas where capability needs to be built to support the 2011–2015 Strategy, and develop a capability investment plan based on identified areas of need. 2.3 Develop a four-year capital plan (equipment and buildings) that is informed by CSIRO's broad science directions and funding availability, and is integrated with the science investment, national footprint and science foresighting processes. 2.4 Implement National Footprint initiatives – specifically closure of Highett and Belmont (Geelong) sites, consolidation in Sydney and Canberra, Floreat co-location and finalisation of the Boggo Road Ecosciences Precinct and Australian Tropical Sciences and Innovation Precinct initiatives.
3. Conducting science with impact	
2010–11 Focus Build internal management practices and external partnerships that enhance the prospects of effective translation of research into impact.	3.1 Grow engagement with industry and government partners nationally and internationally – especially in domains critical to delivery of Flagship goals. 3.2 Strengthen CSIRO's relationship management practices and business development standards and continue to improve CSIRO's commercial reputation. 3.3 Strengthen CSIRO's capacity to both deliver and demonstrate economic, social and environmental impact by developing clear standards and training for project management, and rigorous impact monitoring and evaluation. 3.4 Implement targeted strategies to more effectively communicate CSIRO's capabilities, track record and value proposition to stakeholders. 3.5 Drive the development and uptake of e-research across CSIRO.

Strategic Element	Key Executive Actions
4. Harnessing One-CSIRO	
2010–11 Focus Develop a clear and compelling strategy for 2011–15 and align CSIRO's operating and funding models to support strategy implementation at all levels.	4.1 Finalise the CSIRO 2011–2015 Strategic Plan and communicate effectively to staff and external stakeholders. 4.2 Secure a quadrennium funding agreement with government for the new strategic plan period. 4.3 Reinforce the mutually supporting, but distinctive, roles and responsibilities of Flagships (focused on mission-directed research) and Divisions (focused on capability development), and implement revised investment, operating and governance processes to support these roles and responsibilities. 4.4 Implement a shorter, simpler budget process that delivers the 2011–12 budget by 30 April 2011.
5. Building our people and science excellence	
2010–11 Focus Invest in developing engaged, focused and productive people working in a safe, sustainable and innovative environment.	5.1 Continue to embed a common set of values (CSIRO Values Compass and Code of Conduct). 5.2 Continue to embed a culture of active safety and sustainability leadership and finalise the 2011–2015 Health, Safety and Environment Strategy. 5.3 Benchmark CSIRO's capacity to innovate against international norms (including, for example, the extent to which innovation is facilitated by our structure and processes). 5.4 Build an enterprise wide induction, training and leadership development framework that is aligned with our 2011–2015 Strategy and encompasses scientific and non-scientific staff. 5.5 Renew the Enterprise Bargaining Agreement.



CSIRO's Roles

Our roles in the National Innovation System

A clear sense of the roles that CSIRO plays in the National Innovation System helps us to focus our activities to deliver greater impact. It also helps others to partner with us for maximum benefit for Australia. The role house diagram describes our core roles, Figure 1.

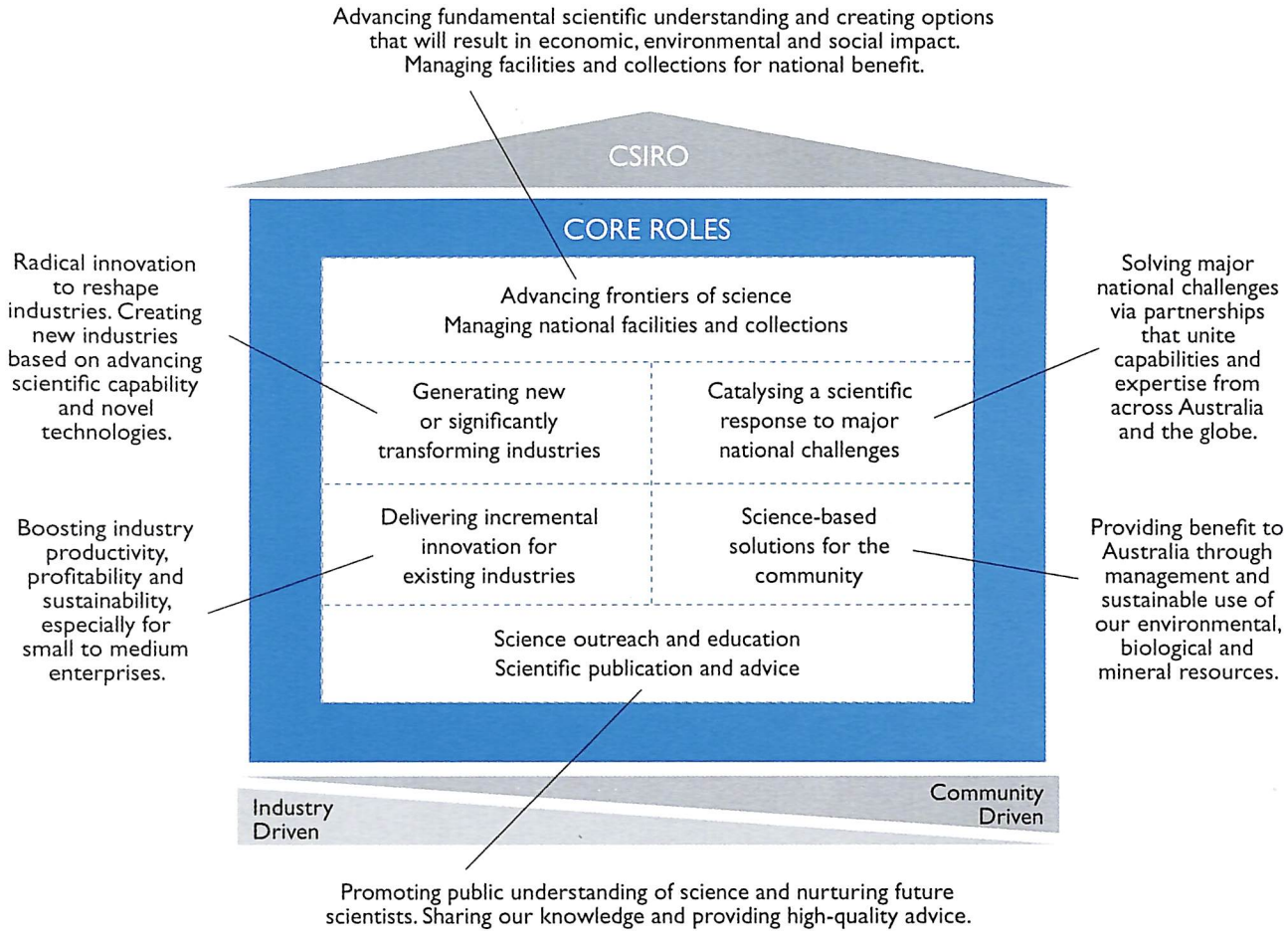


Figure 1–CSIRO's Role House

Outcome Domains

The areas in which our science will have an impact

The role house defines our core roles and the type of activities we undertake. These activities have an impact across a broad range of industry, community and environmental areas or Outcome Domains.

Our areas of focus and the connections across these Outcome Domains are shown as ellipses in Figure 2.

The size of each ellipse reflects approximate investment in this Outcome Domain. Through working in partnership with others, we expect to see new breakthroughs and discoveries and we expect to be able to deliver important and tangible benefits to Australian society in these Outcome Domains.

The Outcome Domains do not represent the structure of CSIRO; they are the areas in which our science will have a positive impact.

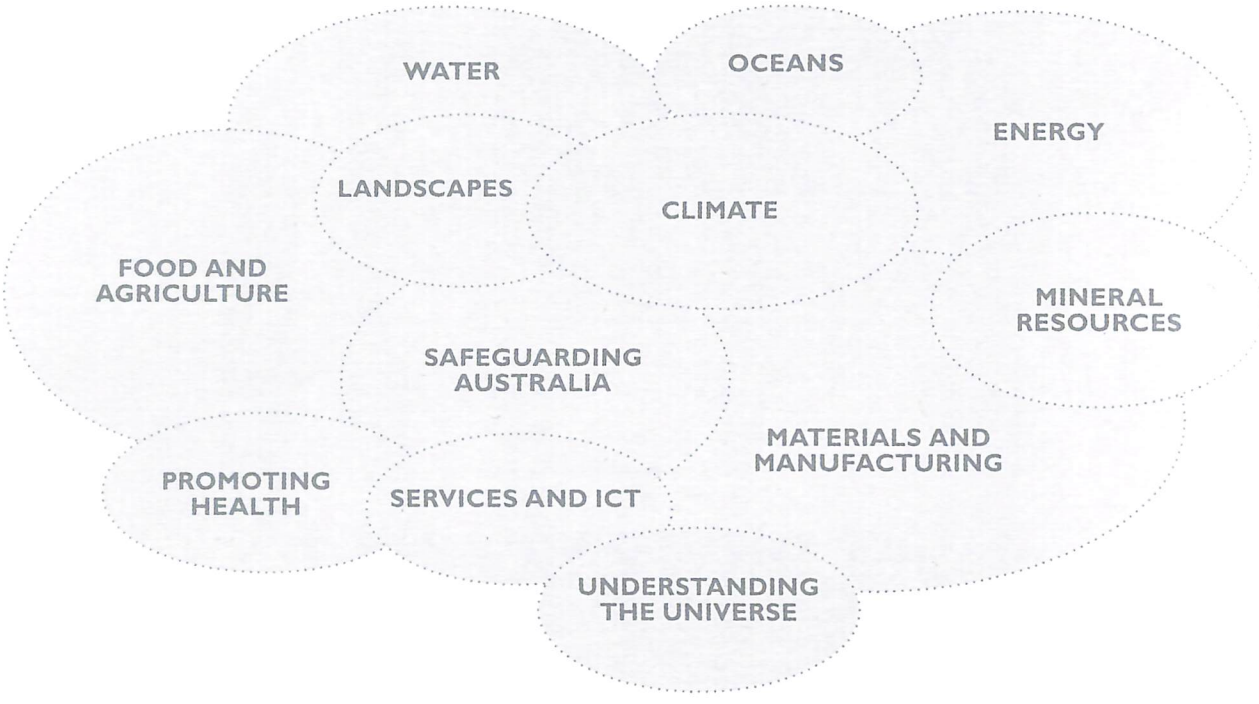


Figure 2–CSIRO's Outcome Domains

Our Customers and Stakeholders

Our ultimate customer is the Australian community. The adoption of our research helps to improve the quality of life for Australians. We deliver to the Australian people through our partnerships with government, universities and industry.

To deliver excellent science outcomes, we develop research relationships with universities and other research organisations with which we have complementary capabilities and objectives.

Sector Advisory Councils provide advice to CSIRO on the direction of research and assist in evaluating performance against planned outcomes. They help to ensure that CSIRO's planned program of research and development is responsive to the strategic research needs of industry and society. Council members are external representatives from important stakeholder groups.

The conduct of excellent science on issues of national priority is fundamental to CSIRO's mission, but is not sufficient for delivering real impact and relevance. Developing strong relationships with potential users and beneficiaries – in both the public and private sectors – is essential to generating impact for the nation. It is by working with, through, and on behalf of others, that results are turned into social, economic and environmental benefits.

Working with Government

As Australia's national science organisation, CSIRO is the government's primary supplier of research and other science and technology services. The government also calls upon CSIRO for information and advice. We engage with government in various ways:

- as part of the Australian Government: as a statutory authority within the Innovation, Industry, Science and Research portfolio
- engaging with government departments and parliament to provide input into policy development, and assist with policy and program implementation and evaluation
- in other contractual and client relationships with governments (Federal, State and overseas).

Helping to service the government's need for informed policy is central to CSIRO's values and strategy of being a trusted advisor – to government and the community – on major issues facing the nation and the world. CSIRO informs policy development, implementation and evaluation in many different ways, for example, by making submissions to Commonwealth and State parliamentary inquiries and providing witnesses to Parliamentary Committee hearings.

Working with Industry

CSIRO aims to provide competitive technological advantage to established companies in Australia and to contribute to the development of new enterprises and industries. We also aim to be the research provider of choice and are committed to working with companies, regardless of size, which have the capacity to be internationally competitive and have a long-term commitment to operating in Australia. We often enter into collaborative relationships with enterprises during the R&D process to improve the rate of success and to speed the selection and development of technologies.

Engagement with Industry and Partners for Impact

CSIRO is a highly collaborative organisation and we work actively with partners and clients to develop and support relationships best suited to achieving mutual goals. We are involved in a very broad spectrum of partnerships and collaborative relationships including:

- Cooperative Research Centres (CRCs): CSIRO is the largest single participant in this program.
- Co-investment: where CSIRO and another organisation jointly invest in a specific research project with negotiated sharing of benefits.
- The Flagship Collaboration Fund: a mechanism developed by CSIRO for involving the wider Australian

"Developing strong relationships with potential users and beneficiaries – in both the public and private sectors – is essential to generating impact for the nation."

and international research communities in achieving the goals of the National Research Flagships.

- Australian Growth Partnerships Program: CSIRO invests funds in technology-receptive Small and Medium Enterprises (SMEs) so they can access CSIRO capability and intellectual property.
- Research Alliances: based on a program of activity rather than a single project.
- Joint Ventures and Centres.
- Licensing of intellectual property and establishment of new companies.
- A range of services provided on a fee-for-service basis, including contract research, technical services and consulting.

CSIRO's Service Charter sets the standards of service we deliver to our customers.

International Connections

We encourage strong international connections. Worldwide we are involved in over 700 current or recently completed research activities in 70 countries. CSIRO is part of the Global Research Alliance to target the United Nations' Millennium Development Goals in water, energy, health, transport and the digital divide. We deliver scientific and technological inputs to foreign trade missions and overseas aid projects.

Working with the Community

CSIRO transfers know-how to the community through workshops and public seminars, publications and booths at community events. Each year, over 690,000 students, parents, teachers and the public participate in a range of CSIRO education and visitor programs; plus we reach a viewing audience in the millions with SCOPE, a children's science television program we jointly produce.

CSIRO believes that Indigenous Australians have extraordinary contributions to make to Australia across cultural, economic and scientific domains. Furthermore, we recognise the social and economic disadvantage experienced by Indigenous Australians and are committed to overcoming the gap between Indigenous and non-Indigenous Australians.

CSIRO's Indigenous Engagement Strategy aims to achieve greater Indigenous participation in our research and development agenda and activities, ensuring that CSIRO benefits from the insights that Indigenous people can bring to the nation's challenges. It also provides a means of ensuring that our activities are as effective as possible in helping to address the challenges and aspirations of Indigenous communities.

CSIRO Values

What we can expect from each other and what others can expect from us

Our values guide our interactions with our colleagues and with our external partners and stakeholders. These values show us what we can expect from each other and what others can expect from us.

We are working to embed these values into everything we do.

The values build on our proud history of delivering excellent science and form the foundation for our strategic planning. Our values describe the behaviours we need to demonstrate to ensure we continue to operate effectively and successfully. They reflect our goals to have an impact without compromising the science, partnerships, and/or collaboration for convenience or short-term gain.

Represented as the CSIRO Values Compass, these organisational values provide us with guiding principles for how individual success can best contribute to and support the success of CSIRO, our partners, the community and the environment. We are guided by these values in everything we do: our decisions, our interactions and relationships.

CSIRO also has a Code of Conduct that is a formal document and is binding on all staff. The Code of Conduct sets out expected standards of behaviour in relation to dealing with the public, external clients and colleagues.

We are successful when:

- our science contributes to an improvement in the prosperity, quality of life and future sustainability of humanity
- our collaborators, partners and stakeholders realise value and outcomes from our science and describe working with us as a pleasure
- our people go home safely and share a sense of achievement
- we are a place where people flourish and want to work
- we are a trusted research advisor.

CSIRO 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, collaborators, industry, research partners and colleagues.
- Taking the **initiative to explore** new horizons and taking responsibility to create 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.

Planning, Investment, Review and Reporting

We must ensure that we wisely invest the resources provided by taxpayers and others

The overall system of planning, monitoring, reviewing and reporting on CSIRO's performance includes:

- the broad objectives and strategies of the Organisation as set out in the Strategic Plan
- enterprise-level activities, resourcing and performance targets for each year, as described in the Operational Plan and Portfolio Budget Statement
- reporting performance against these objectives and targets in the CSIRO Annual Report
- regular reports to the Executive Team and CSIRO Board to assist with their decision-making and governance responsibilities.
- detailed planning and review processes operating at a range of levels, from Portfolios and Divisions to individuals, to ensure that CSIRO achieves its goals and strategies.

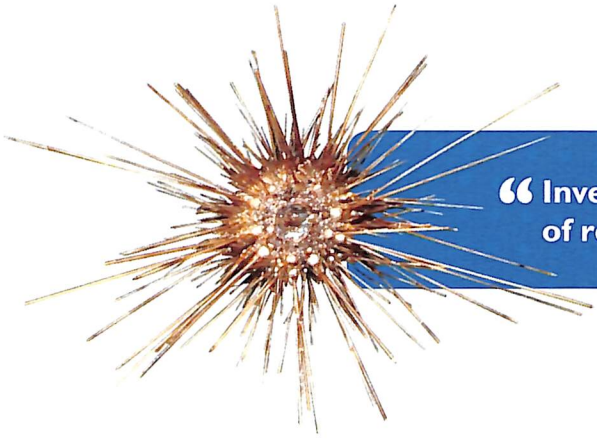
Our science investment process operates within the context of the science planning system. Investment decisions are based on the criteria of relevance and impact for Australia. The key steps in our planning and investment processes are:

- **Broad direction setting** – An annual review of our longer-term strategy and research portfolio and capability development initiatives. This guides the direction and timing of investment shifts and the specific role CSIRO should play in Australia's innovation system.
- **Enterprise-level balancing** – An annual examination and balancing of portfolio, capability and functional investment priorities, taking an enterprise perspective.
- **Performance and investment appraisals** – CSIRO's Appraisal and Investment Committee conducts Portfolio and Divisional appraisals to monitor progress and assess the level of ongoing investment in research themes and capability development. A similar process of performance and investment appraisal is being developed for functional areas.
- **Independent reviews** – Performance appraisal and investment decisions are informed by independent external reviews of Divisions, Portfolios and Functions conducted on a rolling 3–5 year basis. Other ad-hoc or strategic reviews are commissioned on an "as needs" basis.

Our planning directions for 2010–11 are expressed through our research investments detailed on the following pages.

Budget

Revenue by source	2010–11 ($'000)
Annual appropriations from Government	720,885
Funds from other sources	482,406
Total revenue	**1,203,291**



"Investment decisions are based on the criteria of relevance and impact for Australia."

Our Research and Corporate Groups

Internally, our research is managed and delivered through five Research Groups supported by Corporate Groups that provide critical enterprise functions (see Figure 3). Each Research Group comprises a number of:

- Research Portfolios (including Flagships) which contain one or more research Themes with clear and specific goals.
- Divisions that are the creators and custodians of scientific capabilities. They deploy, or allocate, capabilities to meet the objectives of Portfolios.

Corporate Groups

Enterprise functions provide critical support to both 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, strategic and operational human resources capability (including leadership development), communications, procurement, legal and contract administration services, business development, technology transfer and licensing, intellectual property management and management of IT systems.

Also critical is the development and communication of effective strategy and governance processes that help to guide CSIRO staff in fulfilling their duties, focus key management decisions and nurture valuable relationships with key stakeholders.

Energy Group

Divisions: Earth Science and Resource Engineering; Energy Technology.

The Energy Group is developing and applying leading-edge research to meet the triple goals of clean energy, energy security and wealth creation from energy in Australia and the region. Their priority is to help accelerate large-scale greenhouse gas emissions cuts while achieving a smooth transition to a new energy future.

The Group also focuses on understanding Australia's oceans and their biodiversity, resources and relationships with the climate system.

Environment Group

Divisions: Land and Water; Marine and Atmospheric Research; Ecosystem Sciences.

Australians have stewardship of a beautiful, diverse and unique environment. The cumulative effects of the past 200 years of natural resources development has left a legacy of environmental challenges juxtaposed with opportunities for new economies.

The 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 balancing economic development with ecological conservation.

Food, Health and Life Science Industries Group

Divisions: Food and Nutritional Sciences; Livestock Industries; Plant Industry.

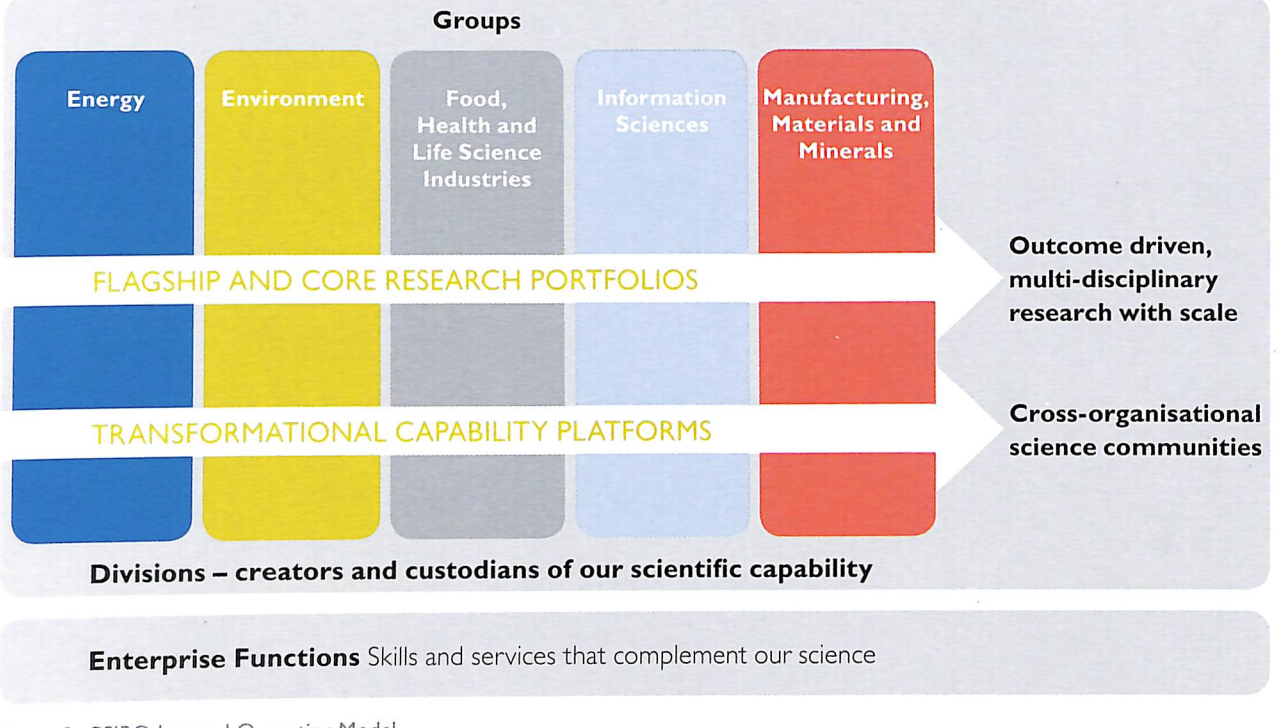


Figure 3–CSIRO Internal Operating Model

The Food, Health and Life Science Industries Group serves large and vital sectors of the Australian economy including the food and fibre value chains, human health sector and more recently the newer industries developing out of the broader application of the Life Sciences. In particular, the Group is responding to a strong demand for science-based solutions to major global challenges such as food security and the need to increase agricultural productivity in a sustainable way, disease prevention in our ageing population, biosecurity and the threat of zoonotic diseases, and the development of sustainable sources of energy and materials.

The Group also carries responsibility for policy oversight of biotechnology/bioeconomy, including regulation of gene technology research.

Information Sciences Group

Divisions: Astronomy and Space Science; ICT Centre; Mathematics, Informatics and Statistics.

The Information Sciences Group contains the core of CSIRO's research in the astronomy, information communication technology and mathematical and statistical services sectors. The aims of the operational units in the Group are to:

- understand the universe and its origins
- develop globally applicable technologies to respond to needs in the ICT and service domains
- develop innovative technologies and services through mathematical and information sciences, research and prototypes.

Manufacturing, Materials and Minerals Group

Divisions: Materials Science and Engineering; Process Science and Engineering

The Manufacturing, Materials and Minerals Group contains the core of CSIRO's research 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 whole value chain
- maximise value to the manufacturing sector by developing and transferring innovative transformational technologies
- develop new materials and products for application in the health and chemical industries.

CSIRO's Outcome and Programs

CSIRO's research investment is allocated across four programs that together contribute to achieving the purpose for which Australian Government funds are appropriated to the Organisation. This purpose is formally described in the Portfolio Budget Statements as an Outcome and is shown with the four programs in Figure 4.

CSIRO's four programs reflect the Organisation's particular focus on delivering scientific solutions to Australian industry and communities, while simultaneously helping to build Australia's science base to meet ongoing challenges and opportunities.

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 distinguished from Core Research and Services in that they are generally larger, multidisciplinary responses with longer timeframes that are targeted to major challenges and opportunities of national or global significance.

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.

CSIRO Program Funding

Funds totalling $1,050 million has been allocated to portfolios and themes across the four Programs as detailed in following sections. An additional $130 million is available for distribution through the Flagship Collaboration Fund and direct investment in capability development programs (see page 25). Around $25 million is budgeted for capital expenditure.

Mapping CSIRO's Programs to Research Groups and Portfolios

The research groups contribute to government programs by taking responsibility for a number of research portfolios as shown in Table 1.

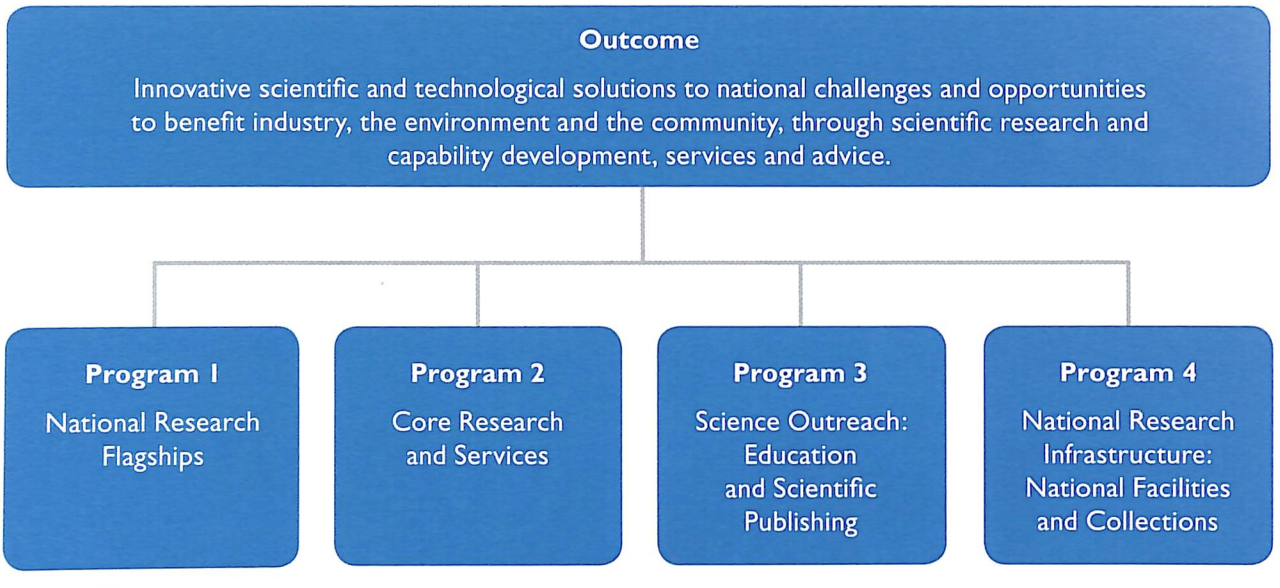


Figure 4–CSIRO's Outcome and Program Framework

Table 1: Mapping of Portfolios/Themes to Progams

	Portfolios			
Group	**Program 1** National Research Flagships	**Program 2** Core Research and Services	**Program 3** Science Outreach	**Program 4** National Research Infrastructure
Energy	• Energy Transformed • Wealth from Oceans	• Coal Technology • IVEC • Petroleum and Geothermal		
Environment	• Climate Adaptation • Water for a Healthy Country	• Ecosystem Sciences • Marine and Atmospheric Research • Biodiversity[1]		• Marine National Facility • National Biological Collections[1]
Food, Health and Life Science Industries	• Food Futures • Preventative Health • Sustainable Agriculture	• Livestock Industries • Food and Health • Plant Industry		• Diagnosis, Surveillance and Response (Australian Animal Health Laboratory)
Information Sciences		• Astronomy • Australian Square Kilometre Array Pathfinder • Digital Technologies and Services		• Australia Telescope National Facility Operations • Canberra Deep Space Communication Complex
Manufacturing, Materials and Minerals	• Future Manufacturing • Light Metals • Minerals Down Under	• Materials Science and Engineering		
Corporate			• Discovery Centre • CSIRO Education Programs • CSIRO Publishing	

[1] *The National Biological Collections are managed within the 'Building Resilient Australian Biodiversity Assets' theme which also undertakes biodiversity related Core Research and Services activities.*

Program 1: National Research Flagships

The National Research Flagships program addresses major national challenges and opportunities through large-scale multidisciplinary 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 adoption and impact.

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

Ten Flagships will be operational, through four Research Groups, in 2010–11. The Flagships' goals are described below and their constituent themes and budget allocations are shown in Table 2, page 20.

Energy Group

Energy Transformed Flagship

Aims to halve greenhouse gas emissions and double the efficiency of the nation's new energy generation, supply and end use.

Wealth from Oceans Flagship

Aims to increase the economic benefits from oceans to Australia by $3 billion a year by 2020, while maintaining the oceans ecological and social values.

Environment Group

Climate Adaptation Flagship

Aims to equip Australia with practical and effective adaptation options to climate change and variability, and in doing so create $3 billion a year in net benefits by 2030.

Water for a Healthy Country Flagship

Aims to provide Australia with solutions for water resources management, creating economic gains of $3 billion a year by 2030, while protecting or restoring the country's major water ecosystems.

Food, Health and Life Science Industries Group

Food Futures Flagship

Aims to transform the competitiveness of, and add $3 billion annually to, the Australian agrifood sector by applying frontier technologies to high-potential industries.

Preventative Health Flagship

Improving the health and wellbeing of Australians and seeking to save $2 billion in annual direct health costs by 2020 through the prevention and early detection of disease.

Sustainable Agriculture Flagship

Securing Australian agricultural and forest industries by increasing productivity by 50 per cent and reducing carbon emissions by at least 50 per cent by 2030.

Manufacturing, Materials and Minerals Group

Future Manufacturing Flagship

Aims to provide transformational innovation for the Australian manufacturing industry, enabling outcomes that will ensure global competitiveness, enhance the manufacturing value chain and deliver high-value export-oriented environmentally sustainable products and services.

Light Metals Flagship

To lead a global revolution in light metals, doubling export income and generating valuable new industries for Australia by the 2020s while also reducing industries' environmental impact.

Minerals Down Under Flagship

To assist the Australian minerals industry exploit new resources with an in-situ value of $1 trillion by 2030 and to more than double the size of the associated services and technology sector to $10 billion a year by 2015.

National Research Flagships: Key Performance Indicators

- 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

Source: Portfolio Budget Statements, 2010–11

Table 2: National Research Flagship Activities 2010–11[2]

Portfolio	Theme	Budget ($m)	Theme Name
Climate Adaptation	1155	12.1	Pathways to Adoption
	1156	14.6	Sustainable Cities and Coasts
	1157	6.0	Managing Species and Natural Ecosystems
	1158	9.5	Adaptive Primary Industries, Enterprises and Communities
Energy Transformed	1016	6.1	Carbon Futures
	1017	24.7	Sustainable Stationary Energy and Transport
	1019	12.2	Local Energy Technologies
Food Futures	1020	20.9	Future Grains – Grain Based Foods and Feeds
	1021	12.5	Breed Engineering
	1023	4.4	Quality Biosensors
Future Manufacturing	1036	8.8	Advanced Fibrous Materials
	1090	13.0	Flexible Electronics
	1103	15.5	Advanced Engineered Components
	1176	18.4	Sustainable Materials
Light Metals	1000	5.8	Aluminium and Magnesium Manufacturing
	1001	7.7	Alumina
	1002	6.7	Aluminium
	1003	1.5	Magnesium
	1004	13.2	Titanium
Minerals Down Under	1055	7.3	Transforming Productivity Through Online Analysis
	1160	21.5	Discovering Australia's Mineral Resources
	1161	12.4	Transforming the Future Mine
	1163	10.0	Driving Sustainable Processing Through Systems Innovation
	1189	7.7	Securing Australia's Future of Australia's Carbon Steel Materials Industry
	1190	19.0	Creating Wealth Through Advanced Processing Technologies
Preventative Health	1025	15.9	Colorectal Cancer and Gut Health
	1026	12.9	Neurodegenerative Disease (Mental Disorders and Brain Health)
	1146	6.4	Obesity and Health
Sustainable Agriculture	1179	14.7	Greenhouse Gas Abatement and Carbon Storage in Land Use Systems
	1180	23.9	Advancing Agricultural Productivity and Environmental Health
	1181	12.6	Landscape Systems and Trend
	1182	8.5	Partnering for International Food and Fibre Security
Water for a Healthy Country	1006	22.9	Urban Water
	1010	13.8	Integrated Water Information Systems
	1136	21.2	Healthy Water Ecosystems
	1137	31.9	Regional Water
Wealth from Oceans	1064	14.9	The Dynamic Ocean: Building Foundations for Climate, National Security and Sustainable Marine Industries
	1177	24.2	Our Resilient Coastal Australia
	1178	21.7	Sustainable Ocean Ecosystems and Living Resources
Total Flagship Program		**537.0**	

[2] *List and budget as at 1 July 2010*

Program 2: Core Research and Services

CSIRO's core research and services activities improve industry, the environment and community wellbeing across the breadth and depth of the national innovation system through the provision of advice, information and solutions including the delivery of new and improved technologies, management systems, intermediate and final products, catalyst services for business, advice relevant to policy development, and new knowledge and skills.

Core research and services are delivered through portfolios, managed by all five Research Groups, with the objectives described below. The constituent themes and budget allocations are shown in Table 3, on page 22.

Energy Group

Coal Technology

Maximising the benefits from Australia's coal resources in an environmentally and socially responsible manner.

IVEC

Provides expertise and resources to industry and government to incorporate advanced super computing technology as part of their operations. IVEC is a joint venture between CSIRO and WA's four public universities with support from the WA State Government.

Petroleum and Geothermal

Supporting a smooth transition to Australia's clean and secure energy future by optimising oil and gas exploration and production, and demonstrating the feasibility of geothermal energy use in Australia.

Environment Group

Ecosystem Sciences

Applies multidisciplinary science to the sustainability of Australia's agriculture and forestry, built environments, biodiversity, communities, and industries.

Marine and Atmospheric Research

Aims to provide the earth-system science that creates new knowledge of Australia's climate, supports adaptation responses to increasing climate change and variability, and advises on mitigation strategies.

Biodiversity

Providing the data, tools and integrating knowledge to underpin a collective national effort to help halt biodiversity decline in Australia by 2020 and reverse this decline by 2035.

Food, Health and Life Science Industries Group

Livestock Industries

Provide research solutions to increase the total factor productivity of Australia's livestock industries and to protect them against the threat of new and emerging diseases.

Food and Health

Conducting research on food processing and food to support the health of the Australian community and the sustainability and viability of the Australian food industry.

Plant Industry

Promoting profitable and sustainable agrifood, fibre and horticultural industries through innovation and the development of new plant products.

Information Sciences Group

Astronomy

To further the advancement of knowledge and understanding of the universe, to ensure the continuing world-class nature of the Australia Telescope and to exploit its unique southern location and technological advantages.

Australian Square Kilometre Array Pathfinder

Maximise returns to Australian science and industry through its participation in the international Square Kilometre Array (SKA) project and development of the Australian SKA Pathfinder.

Digital Technologies and Services

Provide the digital technologies and services that underpin national efforts in the delivery of globally competitive outcomes for society, government and industry.

Manufacturing, Materials and Minerals Group

Materials Science and Engineering

Enabling the creation of novel advanced materials and devices to address national and global challenges and assist the Australian manufacturing sector.

Core Research and Services: Key Performance Indicators

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

Source: Portfolio Budget Statements, 2010–11

Table 3: Core Research and Services Activities 2010–11[3]

Portfolio	Theme	Budget ($m)	Theme Name
Astronomy	1068	3.5	Technologies for Radio Astronomy
	1069	5.2	Astrophysics
ASKAP	1070	12.1	ASKAP: The Australian Square Kilometre Array Pathfinder
Coal Technology	1184	18.4	Coal Production
	1185	9.6	Coal Utilisation
	1186	19.0	CO_2 Capture and Geological Storage
Digital Technologies and Services	1057	4.4	e-Health
	1048	6.1	National Security Technology Partnerships
	1059	14.2	Broadband Wireless for Connecting Australia
	1183	14.8	Services Oriented Systems
Ecosystem Sciences	1077	14.7	Biosecurity and Invasive Species
	1080	9.7	Building Bioindustries with Synthetic Biology
Food and Health	1192	16.2	Food and Health
IVEC	1191	3.6	Interactive Virtual Environment Centre
Livestock Industries	1044	28.3	Transforming Animal Biosecurity
	1045	17.1	Transforming the Animal and its Products
Marine and Atmospheric Research	1132	30.1	Climate and Atmosphere
Materials, Science and Engineering	1088	12.8	Australian Biotech Growth Partnerships
	1089	17.7	Biomedical Materials
	1106	7.1	Industrial Research Services
	1175	9.3	Biomedical Manufacturing
Petroleum and Geothermal	1187	18.0	Gas and Geothermal
	1188	19.9	Petroleum Exploration and Production
Plant Industry	1038	10.6	New Horizons in Plant Science
	1039	10.0	Delivering Quality Crops for Consumer Choice and Improved Industry Competitiveness
	1040	22.1	Plant Fibre and Biofactories for New Agricultural and Industrial Products
	1041	23.4	Designing Crops and Pastures for Australian Environmental Challenges
Total Core Research Program		**377.9**	

[3] *List and budget as at 1 July 2010*

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, divided into three Themes (see Table 4), 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, to enable the community to 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 provides young researchers experience in technology transfer and uptake, which is important for Australia's future innovation.

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, plant and animal sciences, and environmental management.

Science Outreach: Key Performance Indicators

- Utilisation 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 of the Science Outreach programs
- 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

Source: Portfolio Budget Statements, 2010–11

Table 4: Science Outreach Activities 2010–11[4]

Portfolio	Theme	Budget ($m)	Theme Name
Science Outreach	1151	2.2	Discovery Centre
	1153	10.2	CSIRO Education Programs
	1154	9.4	CSIRO Publishing
Total Science Outreach Program		**21.8**	

[4] *List and budget as at 1 July 2010*

Program 4: National Research Infrastructure: National Facilities and Collections

CSIRO manages two types of National Research Infrastructure on behalf of the scientific community to assist with the delivery of research. These are the National Research Facilities and the National Biological Collections. There are five Research Themes associated with this program, see Table 5.

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

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

National Biological Collections are custodians of Australia's biodiversity information. 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:

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

National Research Infrastructure: Key Performance Indicators

- 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)
- Proportion of Collections digitised and available to the public (% of collection)
- Coverage of the National Biological Collections (% of known species)
- Demonstrated response to national events
- Demonstrated high-quality scientific contributions in support of National Research Flagships, CSIRO Core Research and external users
- The AAHL Collaborative Biosecurity Research Facility is built and operated in accordance with the NCRIS/CSIRO agreement

Source: Portfolio Budget Statements, 2010–11

Table 5: National Research Infrastructure Activities 2010-11[5]

Portfolio	Theme	Budget ($m)	Theme Name
National Research Infrastructure	1047	30.1	Diagnosis, Surveillance and Response
	1099	12.7	Marine National Facility
	1067	16.7	Australian Telescope National Facility Operations
	1083	27.1	Canberra Deep Space Communication Complex Facility Management
	1173	26.7	Building Resilient Australian Biodiversity Assets
Total National Research Infrastructure Program		**113.3**	

[5] *List and budget as at 1 July 2010*

Research 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. Across CSIRO, Themes and Divisions are jointly responsible for the development of the 21 major capability groupings shown in Table 6.

In addition to capability development funded through the investments in research Themes, the following programs provide for direct investments in capability development at both the Division and whole-of-enterprise levels.

- **Transformational Capability Platforms** (TCPs) – these platforms 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** – 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 Indicators

- Maintain or improve science excellence in CSIRO research capabilities as assessed through a rolling program of rigorous peer review (% of capabilities rated strong / benchmark)*
- A CSIRO average of a least 1.5 publications per research scientist per year
- Forty per cent of journal publications in top quartile journals
- CSIRO citations per paper at least ten per cent above the world rate in all research fields
- Total citations per paper for all research fields at least 40 per cent above the world rate

Source: Portfolio Budget Statements, 2010–11

Table 6: CSIRO's Research Capability Groups

Capability Group	FTE	Description
Environmental Sensing	75	Deriving information about the Earth's biota, land, water and atmosphere from images and other data sets acquired from sensors, which may be either remote from, or embedded in, the environment.
Earth System Measuring, Modelling and Prediction	177	Measuring, modelling and predicting for elements of the Earth system (eg atmosphere, oceans) and for the system as a whole, including integration with socio-economic modelling.
Marine, Aquatic and Terrestrial Ecosystem Function	372	Measuring and understanding Australia's marine, aquatic and terrestrial biodiversity and ecosystem function, status and performance. CSIRO's biological collections are included in this grouping.
Sustainability Science	276	Understanding the interaction of human social systems with agricultural and resource based production systems (such as mining or fisheries), urban systems and natural systems.
Water Science and Engineering	192	Measuring, modelling engineering and predicting the design and performance of surface, ground and urban water systems, including reuse, water quality and availability.

Capability Group	FTE	Description
Livestock Science	130	Understanding and modifying • the function, performance and genetics of livestock – including those in aquaculture • the interaction between livestock, their food and the environment • animal host – pathogen interactions.
Crop, Tree and Pasture Science	440	Understanding and modifying • the function, performance and genetics of crops, trees and pastures in co-ordination with plant breeding and crop management • plant host – pathogen interactions.
Gene Expression and Bio-synthetic Pathways	294	Understanding and modifying the functional and regulatory relationships between genome, epigenome, transcriptome, proteome, metabolome and phenome in plants, animals, humans, microbes and insects and the pathways controlling their primary and secondary mechanism.
Ecology, Diagnostics and Control of Invasives	158	Identification, understanding and management of invasive species and pathogens; diagnostic testing; and disease control.
Food and Nutritional Science and Technology	326	Designing and testing food ingredients and food processing methods; controlling microbes; and determining the impact of dietary patterns, foods and food ingredients on human health.
Materials Science and Engineering	368	Designing, synthesising, characterising, evaluating and processing advanced materials. Advanced materials: • include small molecules and biological materials such as proteins • exclude minimally-processed biological or mineral materials.
Device and System Engineering	140	Designing, fabricating and testing devices and engineered systems.
Manufacturing Process Engineering	103	The science, technology and engineering of manufacturing processes.
Geosciences, ore and Petroleum Systems Sciences	147	Science and technologies for locating and defining mineral and energy resources.
Mining and Petroleum Engineering	148	The science, technology and engineering of extracting mineral and energy resources.
Resource Processing Science and Engineering	344	The science, technology and engineering of bulk processing of mineral and energy resources.
Energy Conversion, Distribution and End-use Technologies and Systems	113	Physico-chemical processes and technologies for energy conversion, distribution and end-use. Integrated energy and economic modelling.
Analysing and modelling complex data and events	143	Utilising statistical, mathematical and computational sciences to analyse, model or optimise complex data, images, situations and events.
Information and Communication Systems	187	Analysis, modelling and design of communication technologies and networked systems, including use – data capture, transmission, management, visualisation, privacy and security and associated human factors and services.
Automated Systems	67	Science and technologies for automatic decision-making and control of processes, machines and systems.
Astronomical Science and Technologies	265	Science and technologies for understanding the universe, designing and constructing radio-astronomical instrumentation; and operating observatories for radio-astronomy and space tracking.

Image Details for Operational Plan 2010–11

Page	Image Details
Cover	A wind turbine at the Starfish Hill Wind Farm near Cape Jervis, South Australia. Photo: Christine Painter
2-3	Chaffey Dam near Tamworth, NSW, 1996. Photo: Brad Sherman
4	Dr Megan Clark, Chief Executive. Photo: Simon Bayliss
5 (1)	The custom-made DNA microarray (gene chip) containing DNA sequences from over 42,000 organisms. Photo: Tim Wheeler
5 (2)	Inspecting cotton plants. Photo: CSIRO Plant Industry
5 (3)	RAFT provides complete control over the size and shape of polymer molecules. Photo: Morgan Brown
5 (4)	Ears of Wheat. Photo: CSIRO Plant Industry
5 (5)	The Zero Emission House is expected to use up to 70 per cent less energy than a traditional home of similar size. Photo: AusZEH consortium
5 (6)	The Parkes Radio Telescope. Photo: CSIRO Archives
5 (7)	Sandy banks and red river gums along Chowilla Creek, South Australia. Photo: Willem van Aken
5 (8)	The 'Fast Fourier Transform' processor chip was originally developed in the mid 1980s to help radio astronomers find exploding black holes in the universe. That early work led to CSIRO inventing a technology that is now used in almost every wireless local area network (Wi-Fi) device in the world, including laptop computers, smart phones and game consoles. Photo: Denis Redfern
5 (9)	Prawn Salad, recipe from CSIRO Total Wellbeing Diet. Photo: David McClenaghan
8	CSIRO's Leanne Bischof helped design the Gemmological Digital Analyser (GDA) and the mathematical algorithms behind the opal image analysis software. Photo: Chris Taylor
11	Richmond Birdwing butterfly. Photo: Dr Don Sands
12	Brahman cow and calf. Photo: CSIRO Livestock Industries
14	A Sea Urchin from a seamount south of Tasmania. Photo: Karen Gowlett-Holmes
16	Cotton boll. Photo: CSIRO Plant Industry

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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.