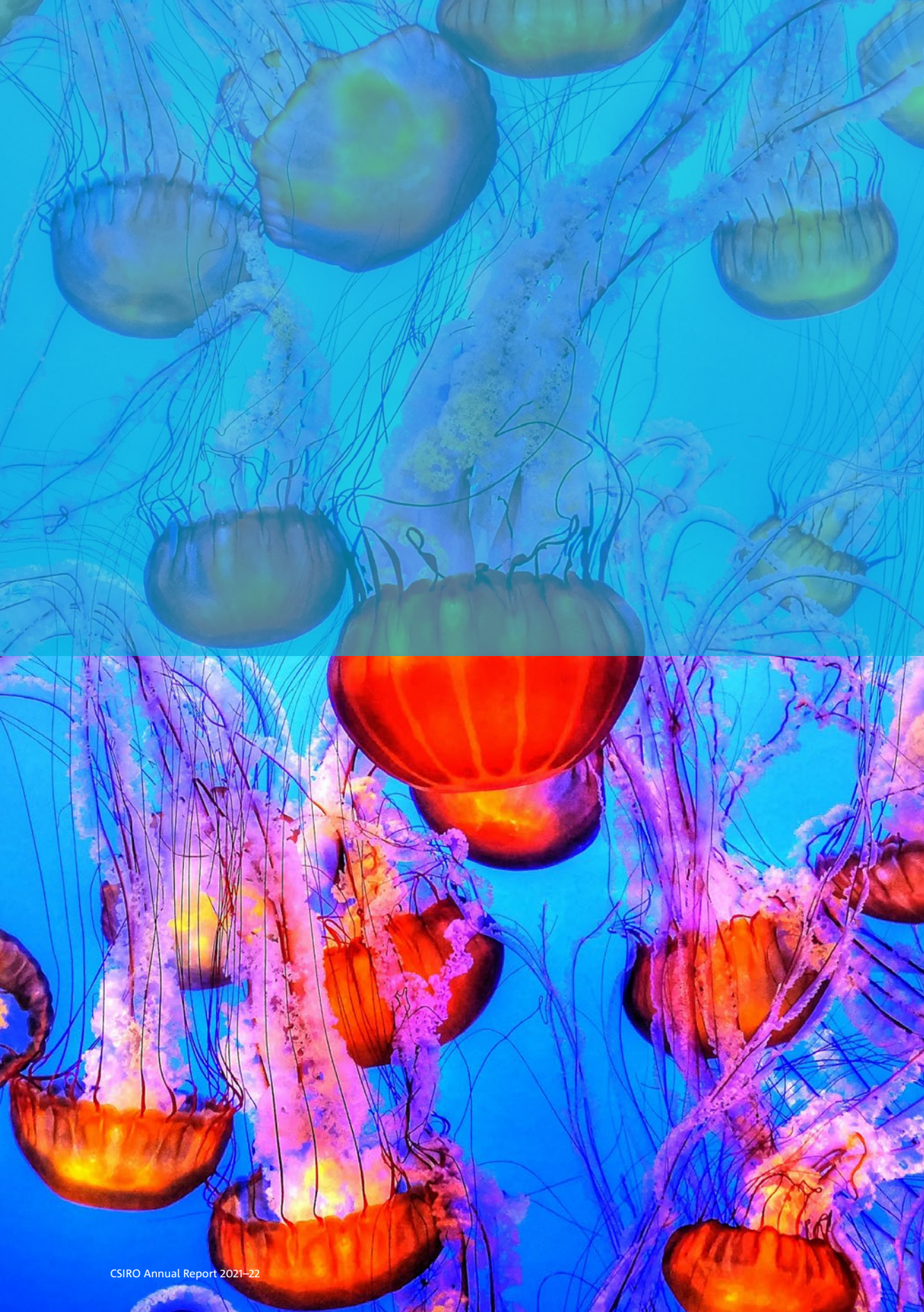
Australia's National
Science Agency

Annual Report 2021–22



Our annual report

This annual report provides a summary of our activities and performance for the financial year ended 30 June 2022 against the planned objectives and outcomes in our Corporate Plan and Portfolio Budget Statements.

Read the annual report online at: csiro.au/annualreport2022

CSIRO

We are Australia's national science agency. As one of the largest and most multidisciplinary mission-driven research organisations in the world, we unlock a better future for everyone.

Our purpose

Solving the greatest challenges through innovative science and technology.

Our vision

Create a better future for Australia.

Cover: CSIRO is delivering science and technology to enable Australia's transition to a net zero emissions energy future. Our research confirms that solar is among the cheapest new-build power generation options, and we are exploring next-generation solar photovoltaic technologies to support the affordable, reliable and sustainable energy system of the future.

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2 September 2022

The Hon Ed Husic MP
Minister for Industry and Science
Parliament House
CANBERRA ACT 2600

We have pleasure in submitting to you, for presentation to Parliament, the 74th Annual Report of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) for the year ending 30 June 2022. This report has been prepared in accordance with the requirements of the *Science and Industry Research Act 1949*, section 46 of the *Public Governance, Performance and Accountability Act 2013* and the *Public Governance, Performance and Accountability Rule 2014*.

The report was endorsed at the meeting of the CSIRO Board members on 2 September 2022.

Part 6 is a report on the operations of the Science and Industry Endowment Fund (the Fund), which was established under the *Science and Industry Endowment Act 1926*. It also includes a report by the Auditor-General on the accounts of the Fund.

The Corporate Commonwealth Annual Reporting Rule requires CSIRO to report any significant activities and changes that affected the organisation or structure. During the reporting period, we have supported government to pivot and transform aspects of our economy while working with our partners to keep Australia's response to both extreme climatic variation and emerging disease agile and effective. We launched new missions and continued our work focused on our nation's greatest challenges in partnership with industry and the community. Our energy transition work is world-leading and supports Australia's efforts to create more value from our natural resources for the benefit of all Australians.

We are proud of CSIRO's achievements this year.

Ms Kathryn Fagg AO
Chair, CSIRO Board

Dr Larry Marshall
Chief Executive, CSIRO

CSIRO
Australia's National Science Agency

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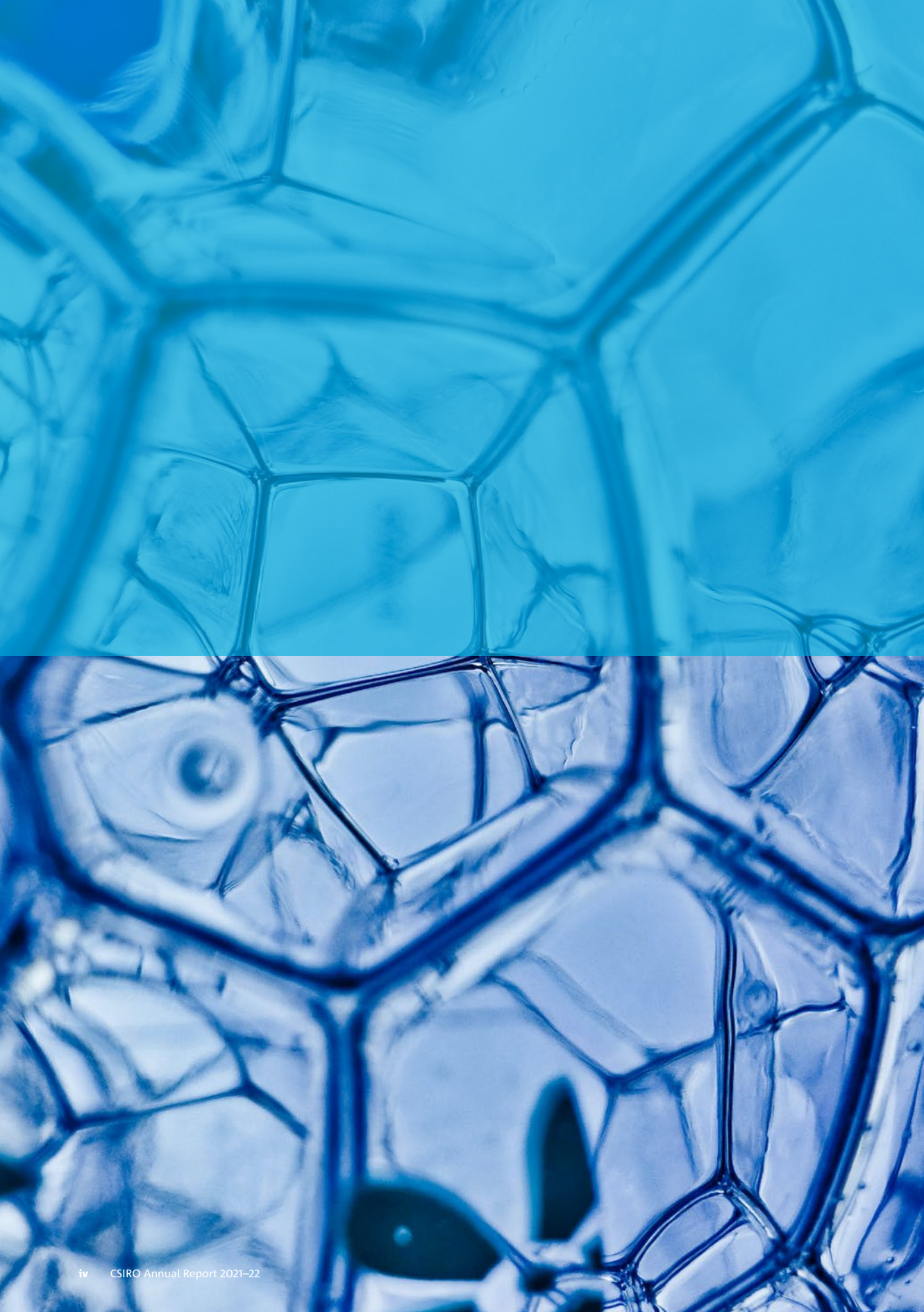


Part 1

Our purpose and strategy

Foreword by the Chair

Australia has faced another challenging year – the continuing pandemic, numerous record-breaking floods and unprecedented energy market disruption, to name a few – and CSIRO has been there with Australia every step of the way. Science and technology hold the key to solving great challenges like these.

As Australia's national science agency, CSIRO is working with partners in industry, government and research to deliver innovative solutions that make life better for all Australians. This Annual Report shares CSIRO's achievements in continuing to solve the challenges that matter most.

CSIRO's deep and broad partnerships have brought together the best minds from around the country to perform brilliant science and deliver high-impact solutions across a diverse range of areas. CSIRO understands market drivers for business partners, aligns with government priorities, develops technological solutions that harness opportunities, reinvents industries and creates jobs that deliver triple-bottom line benefits ranging from energy and biosecurity to manufacturing and healthcare. Its national facilities and collections give all Australian researchers access to world-class resources and are being expanded through the Australian Government's university commercialisation initiatives. Investment in cutting-edge fields of science through the Future Science Platforms has this year expanded to $200 million, including crucial new areas like immune resilience, advanced engineering biology, carbon locking and energy storage. This unique combination of partnerships, facilities and expertise is why Australians have trusted CSIRO for over a century.

Our future relies on a strong pipeline of science, technology, engineering and mathematics (STEM) skilled talent. CSIRO is proud to work alongside numerous community groups to engage students of all ages in science programs, in particular young women and students from Indigenous backgrounds, to grow the diversity and number of students taking up STEM subjects in our universities. This year, that role has been recognised through the Australian Government's expansion of CSIRO's Industry PhD program and Next Gen scholarships program to strengthen pathways from research into industry. Investment in CSIRO's ON program and Innovation Fund, managed by Main Sequence, will also drive stronger research-industry outcomes.

CSIRO's people are at the heart of its success and ongoing sustainability. Over the past year we have continued our commitment to building a thriving culture with the launch of a new Reconciliation Action Plan, a silver award in the Australian Workplace Equality Index awards and an ongoing focus on safety. I'm also pleased to report on CSIRO's strong financial position, demonstrating the importance of our work to industry and government partners in a budget-constrained pandemic environment, as well as returns from investments and equity in deep-tech companies created from our research. CSIRO will continue to invest these returns in new breakthrough science and the wellbeing of its people.

On behalf of the CSIRO Board, I thank David Thodey AO for his leadership as CSIRO's Chair since 2015. Under his stewardship, CSIRO's science-driven forecasting, deep and broad partnerships, and world-class expertise and infrastructure have been focused on anticipating Australia's needs and delivering solutions. I'm honoured to be CSIRO's new Chair and look forward to championing the vital role our national science agency plays for Australia and ensuring it continues to be a trusted, collaborative partner in solving our nation's challenges and inventing a brighter, more prosperous future.

Ms Kathryn Fagg AO
Chair, CSIRO Board

Chief Executive's report

CSIRO was formed over a century ago to connect and catalyse Australia's innovation system, responding to the greatest challenges facing its people, industries and environment.

In the past year, our people have responded with agility and expertise to the evolving threats and crises facing our communities, brought together diverse partnerships to launch ambitious missions and driven commercialisation of world-class science to form deep-tech companies, all supported by a values-driven culture that promotes safety and inclusion. I am proud to celebrate their achievements in this Annual Report.

Record-breaking floods have devastated communities in recent months following a record-breaking fire season. The global pandemic has been followed by outbreaks of diseases like Japanese encephalitis. Australians have turned to science for answers and CSIRO has worked closely with the research community and governments at all levels to respond. Our deep research expertise, world-class facilities and strong networks enable CSIRO to be a part of Australia's rapid response to emerging threats. We're applying our award-winning TraNSIT modelling to flood-prone regions to support stronger planning for natural disasters. We're strengthening Australia's national resilience by working with federal and state governments to respond to natural disasters and climate risk and adaptation, including working with the Bureau of Meteorology, Geoscience Australia and the Australian Bureau of Statistics to create the Australian Climate Service. Our bushfire knowledge continues to support community resilience through home design and smoke management research.

Our high-security biocontainment facility, the Australian Centre for Disease Preparedness, in Geelong is part of a global effort to combat Japanese encephalitis and is involved in Australian responses to local cases, while continuing to contribute breakthrough research to the COVID-19 effort, including innovations in transporting temperature-dependent vaccines to remote communities.

More than defending against emerging threats, we are creating new opportunities for Australia by developing solutions from science that tackle challenges like transitioning to renewable energy, increasing droughts, crowded export markets, feeding a growing global population and reducing pollution. This year, we launched 4 new co-developed missions with our partners, setting bold goals to make life better for all Australians. By 2030, we aim to reduce the impacts of drought by 30 per cent, increase the value of agrifood exports by $10 billion, generate $10 billion in revenue through additional protein products and reduce plastic waste by 80 per cent. This follows the launch of our Hydrogen Industry Mission the previous year. Ambitions of this scale cannot be achieved by one organisation alone, which is why our missions are co-owned with our partners – companies like Microsoft, Google and Fortescue, start-ups, universities and community groups – and backed by federal and state governments.

Australia's brilliant science goes further when commercialised by companies that create jobs and products that can be used by customers every day. This year, we celebrated the successful Initial Public Offering of Chrysos, a company formed to commercialise CSIRO technology for resource extraction, and we welcomed Australian Ethical as a new investor in the CSIRO Innovation Fund, managed by Main Sequence.

In the next financial year, we look forward to increasing our commercialisation activities with the expansion of ON and our Industry PhD program, as well as ongoing partnerships with universities to access our network of national labs to test and develop their innovations.

As a values-driven organisation, we put people first. We are committed to a diverse, inclusive and safe culture at CSIRO that unleashes the talent of our people and attracts the best minds to come from around the world to work with us on creating a better future. This year, we endorsed more than 100 actions in our third Reconciliation Action Plan to build stronger relationships with Aboriginal and Torres Strait Islander peoples, marched at the Sydney Gay and Lesbian Mardi Gras, and set new net zero targets for the organisation, starting with our Energy Centre in Newcastle, NSW, which will reach net zero by 2025, followed by all of CSIRO by 2030. We expanded our school outreach programs and university scholarship programs, and we launched a major recruitment campaign to bring 250 new people into CSIRO during 2022.

As Australia's national science agency, CSIRO is proud to have earned the trust of Australians to deliver solutions from science that make their lives better. We couldn't do this without our valued partners in industry, universities and government. Together, our best minds will continue to tackle and solve the greatest challenges facing this nation, sharing a vision for a brighter future enabled by science-empowered innovation.

Dr Larry Marshall
Chief Executive, CSIRO

About us

As Australia's national science agency, CSIRO solves the greatest challenges through innovative science and technology.

We are Australia's most trusted research institution and most connected innovator, working with universities, governments, Australian businesses of all sizes across all major industries, and communities around the country.

One of the largest and most multidisciplinary research and technology organisations in the world, we manage state-of-the-art research facilities for the nation, for greater collaboration and the development of new technologies to support Australia.

As a mission-driven agency, our research addresses 6 key challenges facing Australia: food security and quality; sustainable energy and resources; health and wellbeing; resilient and valuable environments; future industries; and a secure Australia and region.

We deliver around $8.4 billion of benefit to the nation each year as a result of our science, securing our future national prosperity as well as environmental and social benefits.

The purpose-built facility in Brisbane provides a Moon-like environment for testing and evaluating rovers and related equipment.

5,672 people
delivering across 53 sites throughout Australia and globally

160,000 students
took part in our STEM education programs

For every $1 invested in CSIRO, at least $8.40 in value is returned to the Australian people

We worked with 550 international collaborators and customers across 69 countries

We began cutting-edge future science research in 4 new areas: Revolutionary Energy Storage Systems, Immune Resilience, Permanent Carbon Locking and Advanced Engineering Biology

Since 2017, the CSIRO Innovation Fund has helped to build 42 deep technology companies, which have created over 1,200 technology jobs

We launched 4 new missions: Future Protein, Drought Resilience, Trusted AgriFood Exports and Ending Plastic Waste

Agnes Boddington, *GASKAP-OH*, 2019. Researchers using our ASKAP radio telescope, on Wajarri Yamatji Country, are watching gases in our Milky Way and tracing how the gas changes on its way to forming a star. Growing up in Mullewa, WA, Wajarri Yamatji artist, Agnes Boddington, saw all the different colours of the night sky. Now living in Morawa, she says the sky 'glows just as good as it did when I was a young girl'. This is her interpretation of the night sky where coloured dots represent forming stars.

Our purpose

We are an Australian Government statutory authority within the Industry, Science, Energy and Resources portfolio, operating under the provisions of the *Science and Industry Research Act 1949* (SIR Act). To align with our Portfolio Budget Statement outcome statement, we describe our purpose as:

Solving the greatest challenges through innovative science and technology.

Our vision

Recognising our unique role in Australia our vision is:

Create a better future for Australia.

Our outcome

Consistent with our legislation, our intended outcome as stated in the Portfolio Budget Statements is to produce innovative scientific and technology solutions to national challenges and opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.

Our strategy

Our strategy, outlined in our Corporate Plan 2021–22, directs how we will achieve our purpose. It comprises our objectives, activities and outcomes, supported by strategic pillars that guide our science.

Our objectives

For over 100 years, we have been the mission-led national science agency, collaborating across the innovation system. These primary objectives, guided by the SIR Act, help us to deliver on our purpose:

1. Conduct and encourage the translation of Australia's world-class scientific research into impact.
2. Create and manage Australia's national laboratories.
3. Stimulate innovation for Australian industry, academia and government.

In addition, we aim to ensure the sustainability of CSIRO in order to continue to deliver on our vision, outcome and strategy. Crucial to this is our financial performance revenue from our partnerships and, business and commercialisation activities as summarised in Table 1.1.

We have been successful during the financial disruption caused by the COVID-19 pandemic to deliver an operation surplus of $119 million this financial year, which is better than the budget surplus approved by the Australian Government. This was achieved through careful financial management, with total expenses of $1,387.4 million, externally generated revenue of $557.3 million and Government appropriations of $949 million. See Part 5 for financial reporting.

Table 1.1: Investment in our research by source, $m

REVENUE SOURCE	2017–18	2018–19	2019–20	2020–21	2021–22
Australian Private Sector	84.4	85.9	86.4	88.7	83.9
Australian governments	173.9	208.9	208.8	213.4	269.4
Rural industry research and development corporations	42.7	44.5	38.2	35.6	30.3
Cooperative Research Centres	9.1	9.8	9.5	9.6	9.4
Overseas entities and international	93.6	93.2	98.6	75.3	73.2
Work in progress/deferred revenue	-2.8	-8.9	-9.2	-26.7	-40.5
Total co-investment, consulting and services	**400.8**	**433.4**	**432.2**	**395.9**	**425.6**
Intellectual property (IP) – royalty and licence revenues	43.2	34.4	28.6	38.9	49.7
Total research and services revenue	**444.0**	**465.7**	**450.8**	**434.8**	**475.3**
Other external revenue	55.1	48.6	40.6	26.0	25.9
Gain/(loss) on sale of assets	0.1	11.5	1.6	2.5	0.7
Other fair value gains and reversals	–	1.1	40.8	36.2	55.5
Total external revenue	**499.2**	**529.0**	**573.4**	**499.6**	**557.3**
Revenue from government*	793.5	834.6	837.9	960.5	949.0
Total revenue	**1,292.7**	**1,363.6**	**1,381.6**	**1,460.1**	**1,506.3**
Less expenses	1,352.5	1,396.4	1,388.6	1,383.2	1,387.4
Operating result	**-59.8**	**-32.-5**	**-7.0**	**76.9**	**119.0**

*See note 1.2F in the Financial statements.

Solving the greatest challenges

We identified 6 challenges of the greatest importance to Australians. These are outlined below with examples of the research we are delivering today.

1 Health and wellbeing

Enhancing health for all through preventive, personalised, biomedical and digital health services.

- Dengue virus and Japanese encephalitis can spread through mosquito bites. CSIRO has partnered with universities and governments to collaborate on mosquito suppression programs and diagnostic testing to help eradicate mosquito-borne disease. Read more on page 31.
- Two of our portfolio health-related companies are making progress and having impact including Saluda Medical gaining approval in the USA for a treatment for chronic pain and Coviu has gained funding to conduct further work on digital health tools, see page 53.

2 Food security and quality

Achieving sustainable regional food security and growing Australia's share of premium agrifood markets.

- In the early 2000s, CSIRO Agriculture and Food researchers first theorised that canola could be used as a dual-purpose break crop, to protect against crop pests while also being grazed by livestock and harvested for grain. Read about how the theory has been put into practice in multiple mixed-enterprise farms across Australia on page 84.
- With an expected 2 billion extra people to feed by 2050 the world is going to need to produce more protein and we are using our science to respond to this need. Read more about this work on page 40.

3 A secure Australia and region

Safeguarding Australia from risks such as war, terrorism, pandemics, disasters and cyber-attacks.

- Australia actively partners with the Asia-Pacific region to participate in biosecurity to reduce the risk of diseases transmitting due to habitat disruption and increased global trade and travel. Read more about the Australian Centre for Disease Preparedness and the critical role we play in animal disease research and investigation on page 93.
- CSIRO partners with our neighbours helping to aid their recovery from the COVID-19 pandemic and ensuring food security. See more about our international work on page 95.

4 Resilient and valuable environments

Enhancing the resilience, sustainable use and value of our environments.

- Australia has finite water resources. Our Agtech solutions and algorithms are assisting to reduce the cost of irrigation and carbon emissions into our environment. Read more about this on page 85.
- We have developed technologies to help local communities to better predict bushfire behaviour and keep communities safe. Read more about our work on this on page 29.

5 Sustainable energy and resources

Unlocking our energy and resources potential and supporting the transition to a low emissions future.

- Australia is transitioning to a lower emissions future with a vision of clean hydrogen energy by 2030. We are working with government, universities and industry to research and develop clean hydrogen technologies to help achieve the targets. Read more on page 25.
- We are working on energy transition research by partnering with the Australian Energy Market Operator to contribute to the Global Power System Transformation consortium. Read more on page 92.

6 Future industries

Creating Australia's future industries and jobs by collaborating to boost innovation performance and promote science, technology, engineering and mathematics (STEM) skills.

- Observation satellites are central to the lives of all Australians, for forecasting the weather, responding to natural disasters and supporting farmers in the regions. Read more about our share in the NovaSAR-1 Earth observation satellite on page 33.
- This year several SME Connect program alumni were awarded funding from the Australian Government to further their work including Gilmour Space Technology and Arafura resources. Read more about these innovative companies on page 72.

Strategic pillars

Three pillars guide our operations and how we bring our purpose, vision and strategy to life.

Deliver real solutions from excellent science and technology

We imagine tomorrow's needs today to create solutions and opportunities with our customers through excellent science and technology and businesses approaches.

Improve innovation from greater collaboration

We build networks of brilliant minds, working with research partners and industry customers, nationally and globally. We drive the adoption of solutions with our engineering and commercialiser role to turn great science into great solutions.

Bring out our best from thriving culture and teams

Our people belong to and drive our strong and inclusive one-CSIRO culture. We thrive when we work with others who share our goal of making life better for all Australians.

Missions

To help solve the 6 critical challenges, in addition to the science CSIRO delivers every day, we are developing and launching missions. These are big, bold initiatives that aim to tackle big, multi-faceted problems by bringing together research agencies, universities, industry, government and community to work collaboratively on outcomes that lead to positive benefit, new jobs and economic growth.

They may begin as CSIRO missions but are co-developed with partners in Australia and overseas to achieve impact well beyond our own organisation. Some of the partners include Google, Commonwealth Bank Australia and the United States National Science Foundation as well as non-government organisations such as Ocean Protect and Conservation Volunteers Australia.

We are working towards launching more missions in the future and continue to drive Australia's future resilience and supporting productive growth through innovation. Read more on pages 38–39.

Scientists working on equipment for hydrogen membrane technology.

Values

Our values describe what we consider important within our organisation. By translating our values into behaviours, we help people to shape our work environment and make explicit how we should each 'show up' to do our jobs. In this way our values are a powerful framework to help our people understand the kinds of attitudes and behaviours we need to display to deliver on our strategy.

People first

We prioritise the safety and wellbeing of our people. We believe in, and respect, the power of diverse perspectives. We seek out and learn from our differences. We do our very best to get all this right.

We do this by being:

- respectful
- caring
- inclusive.

We have increased the number of women in CSIRO leadership positions to

41.1 per cent

Further together

We achieve more together than we ever could alone. We listen and collaborate, in teams, across disciplines and across boundaries. We embrace ambiguity and use discussion and persistence to generate unique solutions to complex problems.

We do this by:

- partnering
- cooperation
- humility.

Our Future Science Platform program drives interdisciplinary collaboration across teams

93 per cent

of our people are proud to be associated with CSIRO

Making it real

We do science with real impact. We thrive when taking on the big challenges facing the world. We take educated risks and defy convention. We celebrate successes and failures and leverage them to learn as we strive to be the force for positive change.

We do this by being:

- curious
- adaptive
- entrepreneurial.

Trusted

We're driven by purpose but remain objective. We fight misinformation with facts. We earn trust everywhere through everything we do. We trust each other and we hold each other accountable. Together our actions drive Australia's trust in CSIRO.

We do this by being:

- accountable
- authentic
- courageous.

Celebrating our people

Our exceptional people underpin our impact and bring our science to life. Many of our people have been commended for their expertise and we are extremely proud of their successes. This is a selection of their recognitions during 2021–22.

Member of the Order of Australia (AM)

Dr Graeme Batley, CSIRO Fellow and former Chief Research Scientist, Land and Water, for significant service to environmental toxicology and chemical science.

Dr Amanda Barnard, Chief Research Scientist, CSIRO's Data61 from 2009–20, for significant service to computational science, to medical research and to education.

Companion of the Order of Australia (AC)

Dr Graeme Moad, CSIRO Fellow, Manufacturing, for eminent service to science, particularly polymer design and synthesis and radical polymerisation, to education through mentoring, and to professional scientific organisations.

Professor Tanya Monro, CSIRO Board member, for eminent service to scientific and technological development, to research and innovation, to tertiary education, particularly in the field of photonics, and to professional organisations.

Officer of the Order of Australia (AO)

Dr Tom Beer, for distinguished service to science, particularly environmental risk, climate processes and sustainability, through research organisations.

Dr John Church, for distinguished service to climate science through oceanographic and sea-level research and publications.

American Geophysical Union Fellow 2021

Dr Steve Rintoul, for exceptional and sustained contributions to our understanding of the Southern Ocean and its role in climate.

APEC Science Prize for Innovation, Research and Education (ASPIRE 2021)

Dr Jessica Bogard, for her work in food production systems, aiming to increase accessibility of healthy and sustainable foods to vulnerable populations in low- and middle-income countries.

Association of Asia Pacific Physical Societies Division of Plasma Physics (AAPPS-DPP) 2021 Plasma Innovation Prize

Dr Anthony Murphy, for his research in thermal plasmas for industrial applications, as well as destruction of harmful ozone-depleting compounds.

Australian Academy of Science Fellowship

Dr Elizabeth (Beth) Fulton, a global pioneer of whole of ecosystem modelling whose work was the first in the world to effectively represent the entirety of marine ecosystems. Her ground-breaking modelling approaches, recognised by the Food and Agriculture Organization (FAO) as world's best practice, have directly influenced the sustainable management of marine systems on 5 continents.

Australian Academy of Science 2022 Pawsey Medal

Dr Keith Bannister, an exceptional scientist with a deep understanding of astronomy and radio-science engineering, for outstanding research in physics by an early career researcher. His work on the detection of fast radio bursts opened up a new field of study in radioastronomy and enabled measurements of the Universe's missing matter – solving one of astronomy's biggest questions.

Australian Academy of Science 2022 Pawsey Medal winner: Dr Keith Bannister.

Australian Academy of Science 2022 Ruby Payne-Scott Medal and Lecture

Dr Elizabeth Dennis AC, an eminent plant molecular biologist, for addressing important plant development questions, vernalisation-induced flowering and increased yield of hybrid varieties. Her research has contributed to global food security by creating high yielding crops.

Australian Academy of Technology, Science and Engineering (ATSE) Fellowship

Dr Graeme Moad AC, a renowned chemist at the forefront of polymer science, in recognition of his research in the fields of polymerisation mechanisms, and polymer design and synthesis. He was a key inventor of CSIRO's RAFT technology, which has garnered worldwide acclaim.

Defence Science and Technology Eureka Prize for Outstanding Science in Safeguarding Australia

CSIRO's Data61, as part of the Cross Domain Desktop Compositor team, for their work combining a world-class secure operating system with novel hardware architecture to keep sensitive information secure from internet attacks.

ICM Agrifood Award (ATSE) 2021

Dr Anna El-Tahchy, Chief Technical Officer at Nourish Ingredients, a company founded by former CSIRO scientists, who is leading efforts to improve the flavour and sustainability of plant-based meat substitute food products.

Dr Lindsay Bell, for world-leading research helping dryland crop and livestock farmers manage climate variability.

International Association for Cryptologic Research (IACR) Fellow

Professor Josef Pieprzyk, for significant contributions for design and analysis of cryptosystems, and for exceptional service to the IACR and the Asia-Pacific cryptographic community.

Australian Academy of Science 2022 Ruby Payne-Scott Medal and Lecture winner: Dr Elizabeth Dennis AC.

International Hydrology Prize 2022 – Volker Medal (International Association of Hydrological Sciences)

Dr Francis Chiew, for outstanding contributions to hydrology, particularly the application of research for the benefit of society.

2021 Malcolm McIntosh Prize for Physical Scientist of the Year

Dr Keith Bannister, for his pioneering research into fast radio bursts, which is solving several big astronomical mysteries. His discoveries have captured the public's imagination and placed Australia at the centre of an important new field of astrophysics research.

Web of Science Highly Cited Researchers 2021

Dr Wenju Cai, **Dr Pep Canadell**, **Dr Beth Fulton**, **Dr Alistair Hobday** and **Dr Ying-Ping Wang**, were among the most cited authors in their respective fields of study. The Highly Cited Researchers list recognises leading researchers in the sciences and social sciences through the publications indexed in the Web of Science core collection that rank in the top 1 per cent by citations for their field and year.

2020 Williamson Award (VALA – Libraries, Technology and the Future)

Anne Stevenson, for demonstrating leadership and innovation in library information technology including in implementing automation of ORCiDs to update researcher records from the Research Publications Repository.

Women in AI Awards 2022, AI Innovation Award

Dr Denise Bauer, for her work in bringing AI solutions to the global market through cloud computing.

The CSIRO Chairman's Medal for Science and Engineering Excellence

This award recognises teams who have made significant scientific, engineering or technological advances that create value for our customers via innovation that delivers positive impact for Australia.

PhotonAssay Team, for breakthrough innovation of PhotonAssay technology delivering rapid, safe and accurate analysis of gold and other precious metals in mining applications and commercialisation for industry deployment through the start-up company, Chrysos.

The CSIRO Sir Ian McLennan Impact from Science and Engineering Medal

This award provides visible recognition of outstanding practical contributions to industry and recognises exceptional individuals or research teams who have created value for customers through innovation that delivers impact for Australia.

Dual Purpose Canola Team, for conceiving, developing, and translating the novel and now widely adopted practice of dual-purpose canola for both grain and grazing with profound impact on crop productivity and sustainability, and resilience of mixed farming systems.

CSIRO Medal for Lifetime Achievement

This award recognises individuals who have a record of sustained and meritorious achievements in science, technology and innovation or the support of science, technology and innovation.

Dr Surinder Singh, for establishing CSIRO as a world leader in metabolic engineering and developing the next generation of commercial oil crops with triple bottom line impact. Dr Singh has demonstrated incredible leadership over 2 decades, both in his field and as an inspiration to others. He has brought people together, pushed the boundaries of science with collaborative innovation and helped to grow the next generation of science leaders.

Dr Steve Rintoul, for leadership in creating new knowledge about the role of the Southern Ocean in regional and global climate, including motivating international collaboration, inspiring early career researchers, and translating knowledge for policymakers. He has led the design, resourcing and implementation of major field programs, including 16 research expeditions to the Southern, Indian and Pacific Oceans.

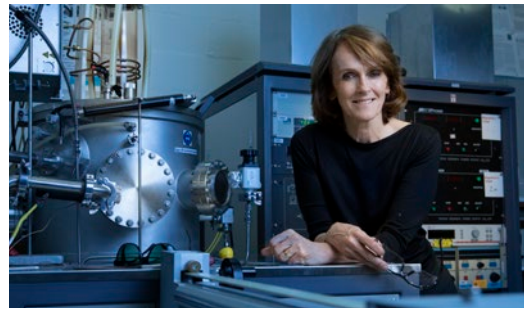
Dr Rai Kookana, for pioneering new areas of science that provide the foundation for CSIRO's research platforms on emerging chemicals of concern for environmental protection in Australia and globally. Over 30 years of outstanding research, he has established himself as an absolute leader in his field. Dr Kookana has put CSIRO at the forefront of this research and through scientific excellence and incredible dedication, he is a globally recognised organic chemicals authority.

Dr Cathy Foley AO, for her scientific excellence and influential leadership including developing the Quantum Technology Roadmap for Australia. Dr Foley joined CSIRO in 1985 as a research scientist with our manufacturing teams and became CSIRO's Chief Scientist in 2018. She is a high profile and strong advocate for science. Her achievements include her team's breakthrough work in SQUID systems for mineral exploration, which was commercialised in LANDTEM technology and has led to mineral discoveries worth over $6 billion.

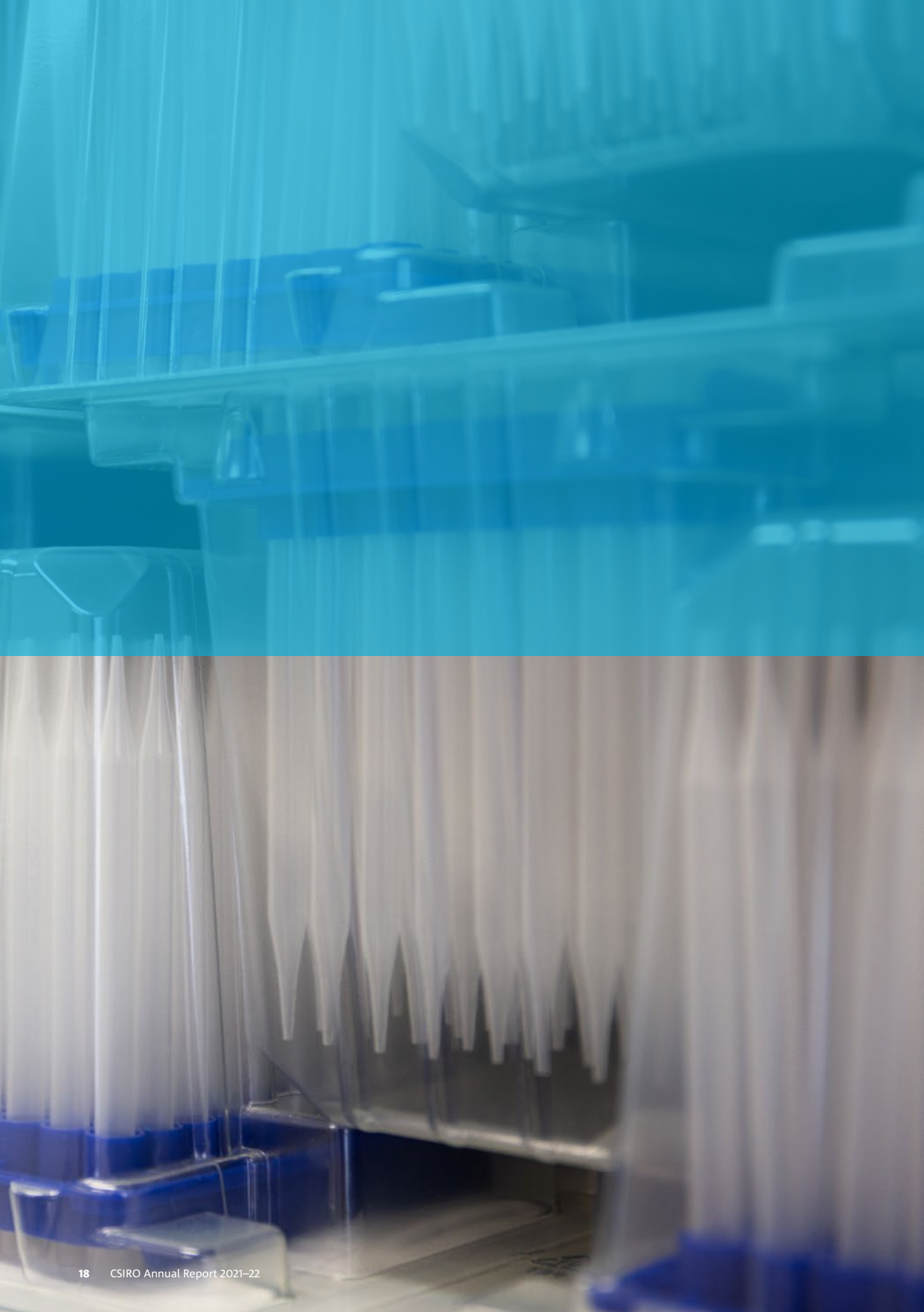
CSIRO Medal for Lifetime Achievement winner: Dr Surinder Singh.

CSIRO Medal for Lifetime Achievement winner: Dr Rai Kookana.

CSIRO Medal for Lifetime Achievement winner: Dr Steve Rintoul.



CSIRO Medal for Lifetime Achievement winner: Dr Cathy Foley AO.



Part 2

Future industries to transform Australia

Transforming Australia

We have supported Australians over many decades and continue to use our science to find ways to transform Australia's capability to overcome our challenges. Our science has strengthened, re-imagined and invented new industries for Australia to drive our economic recovery and build future resilience.

We work with industry, government and the research sector to build the capability of a new generation of STEM leaders.

The following case studies illustrate some of our recent solutions from science that are transforming Australia and creating a better future.

Using AI to tackle feral herds in the Top End

There are an estimated 120,000 feral water buffalo and hundreds of thousands of feral cattle in far Northern Australia. This causes land degradation, overgrazing on native vegetation, and erosion and destruction of rivers and wetlands.

We are working with Indigenous rangers managing feral herds on their land. Dubbed 'SpaceCows', the project brings together local Indigenous knowledge, space technology and Artificial Intelligence (AI) to develop technology and practices to efficiently handle the animals. It will also enhance rangers' understanding of the dynamics of feral herds and help pinpoint their location. This will also assist to leverage potential economic opportunities, either from the mustering and sale of animals or from increased participation in feral animal management actions.

This training program aims to embed best practice ethical mustering and handling methods for feral cattle and buffalo for indigenous rangers, by one of the project partners, the Northern Australian Indigenous Land and Sea Management Alliance. This program will foster indigenous led economic development, environmental management and education.

This project combines one of the world's largest satellite herd tracking programs, unprecedented spatial data sets and innovative data-driven planning tools to create a space technology powered digital twin. Other partners include satellite IoT company Kinéis, James Cook University, Mimal Land Management Aboriginal Corporation, Aak Puul Ngangtam, Normanby Land Management, Charles Darwin University and Microsoft.

This $4 million, 4.5-year initiative is underway with technology and insights to be publicly released in 2024. The project is supported by the Australian Government's Smart Farming Partnership initiative.

Feral cattle stand in a pen after mustering. Credit: Seth Seden.

Walking with Australia's first scientists

Aboriginal and Torres Strait Islander peoples are Australia's First Scientists, and we are committed to meaningful collaboration that shares and builds knowledge and understanding.

Our Reconciliation Action Plan outlines our commitments, ranging from procurement and recruitment to our research and relationships with communities. We are early in our journey towards building stronger relationships and meaningful collaboration, and we actively look for opportunities to improve every day.

Plants and animals of Noongar Nation break new ground in Indigenous knowledge tool

In 2021, the Atlas of Living Australia (ALA), hosted by CSIRO, partnered with the Noongar Boodjar Language Cultural Aboriginal Corporation in Perth, Western Australia, to launch the Noongar Boodjar plant and animal encyclopaedia. This digital encyclopaedia links Indigenous species names with western scientific (both Latin and Common) names as well as ancestral ecological and cultural knowledge across more than 90 plant and animal species chosen to be shared by local communities. For example, the entry for Witchetty Grub includes its Latin name (Endoxyla), its Noongar-Wudjari name (Baardi), and the Wudjari name for animal (Barna). It also captures the description of 'no legs or bits or spikes hanging off them', and that it tastes like 'almonds and butter'.

The encyclopaedia was developed through field trips with Elders, western-trained and Indigenous scientists, and linguists from the Noongar Boodjar Language Centre going out on Country to share and record ecological knowledge. This work also established 'ways of working' protocols and strong inter-organisational relationships between the language centre and the ALA. The encyclopaedia is an important step towards better integration of traditional and western knowledge and will help inform future researchers.

The project is a joint initiative with funding from the Australian Government's Indigenous Languages and Arts Program and was co-designed to ensure Noongar languages are actively rebuilt and revitalised. The encyclopaedia is publicly accessible on the ALA website and more information is available on our website, csiro.au. Read more about the ALA on page 62.

Baardi is the Noongar Boodjar language name for Witchetty Grub (Endoxyla). Credit: Noongar Boodjar Language Centre.

Gail Yorkshire welcomes Gerry Turpin to Country through a smoking ceremony. Gerry is a Mbabaram Traditional Owner and Australia's first formally trained Indigenous Ethnobotanist. He comes from Cairns and joined this project to help link traditional names for plants and animals to scientific names and as a cultural exchange advisor.

Mission-led science to drive economic recovery

Australia's economic recovery and future resilience in the wake of COVID-19 can be driven by harnessing science and technology to solve our greatest challenges, creating opportunities for Australia to lead on the world stage in areas where we have unique national advantage. Our Missions program aims to seize these opportunities, developing missions in partnership with industry, research and government to take a unified national approach to achieve these goals.

Since announcing the Missions program in 2020 we have launched 5 missions with our partners, each with an ambitious target to deliver by the end of this decade. They leverage areas of research where Australia leads the world and industries where we have a history of innovation and expertise to solve problems that Australians care deeply about.

Hydrogen Industry Mission

The Hydrogen Industry Mission was launched in 2021 to achieve the vision of the National Hydrogen Strategy adopted by all federal, state and territory governments in 2019. It aims to help Australia to transition to lower emissions energy systems by building Australia's clean hydrogen industry and lowering the cost of clean hydrogen to under $2 per kilogram by 2030. The Mission is focused on hydrogen research, development and demonstration (RD&D) partnerships and projects as follows:

- **Hydrogen Knowledge Centre**: Our online national resource for industry, government and the research community highlights Australia's hydrogen projects and provides modelling tools and educational resources to other actors in the system.
- **Feasibility and strategy studies**: For the European Union's Clean Hydrogen Mission initiative, we authored a report analysing global research, development and innovation priorities in support of clean hydrogen industry development with partners in the USA and UK. The Australian Government released this report at the 2021 United Nations Climate Change Conference (COP26).
- **Demonstration projects**: We are working with partners to validate hydrogen value chains and de-risk enabling technologies. A new refuelling station and technology demonstration centre is being developed at our Clayton campus in Melbourne in partnership with Swinburne University of Technology and the Victorian Government. Industry partners have tested hydrogen technologies at the new facility.
- **Science, technology and socio-economic analysis**: The Mission helps connect early-stage research and development expertise developed in our Hydrogen Energy Systems Future Science Platform, such as techno-economics of the hydrogen value chain, to industry or government partners in need of this expertise. We manage a major Hydrogen RD&D International Collaboration Program, which is a $5 million initiative funded by the Australian Government.

The 5-year Hydrogen Industry Mission consists of over 100 projects with partners, including the Department of Industry, Science, Energy and Resources (DISER), Australian Renewable Energy Agency (ARENA), Fortescue Future Industries, Swinburne University, the Victorian Government, the Future Fuels Cooperative Research Centre (CRC), National Energy Resources Australia (NERA) and the Australian Hydrogen Council, along with collaborators such as Boeing, Toyota and Hyundai.

L to R: CSIRO Chief Executive Dr Larry Marshall with Hydrogen Industry Mission Engagement and Strategy Lead, Dr Vicky Au, and Hydrogen Industry Mission Lead, Dr Patrick Hartley.

Targeting $20 billion boost for Australian agriculture

Australia's agriculture and food production systems are being rethought to account for drought and capitalise on new opportunities in protein and export markets, with 3 key opportunities emerging. In September, we launched 3 missions to solve these challenges and grow Australia's agriculture and food sector. These missions aim to turn $150 million of initial investments from CSIRO, government, industry and the research sector into $20 billion for Australian agriculture and food. By 2030, we aim to:

- build resilience to drought by reducing the impact of drought on farms and communities by 30 per cent
- help capture high-growth global protein markets by creating $10 billion new and value-added protein products
- grow export premiums of Australian grown food by $10 billion.

Drought Resilience Mission

We aim to reduce the impacts of droughts through new farming systems that use water more efficiently, technologies to secure regional water supplies, and new tools based on localised climate data that will make farming into the future easier. The Mission will protect agricultural profitability, strengthen the economic resilience and water security of regional communities, and improve environmental outcomes. It brings us together with the Department of Agriculture, Water and the Environment (DAWE), the Bureau of Meteorology (BOM), and other collaborators in industry and communities.

A new online platform, Climate Services for Agriculture (CSA), enables farmers to see how future climate could impact their farm based on their location and what they produce. The second prototype was released in December and is being piloted across 8 Australian regions. We are developing CSA in partnership with BOM, FarmLink Research and the Australian Government's Future Drought Fund.

Future Protein Mission

Australia's growers and producers have a $10 billion opportunity to create new and value-added products from all types of protein for the world's growing population. The Mission will grow existing livestock and aquaculture industries, develop new plant-based products and use new technologies such as biomanufacturing to create new proteins or even transform waste products into high value food products. It brings together CSIRO; the Department of Industry, Science, Energy and Resources; Meat & Livestock Australia; the Grains Research & Development Corporation; industry partners like v2food, GrainCorp, The EVERY Company and Wide Open Agriculture; and start-ups like Eden Brew.

Trusted Agrifood Exports Mission

The Trusted Agrifood Exports Mission is a partnership between CSIRO, DAWE and Meat & Livestock Australia to digitally transform Australia's agrifood supply chain and grow export premiums across commodities. By collectively working towards the Mission's goal, opportunities and impact will be achieved with greater speed and scale. The Mission will develop and deliver new tools and technologies that verify the safety, quality and sustainability credentials of Australian produce. We also aim to build trust in food traceability and credentials, which will improve access to high value markets and bolster Australia's reputable food brand.

Meat & Livestock Australia joined the Trusted Agrifood Exports Mission as a partner in 2021, committing $12 million over 3 years towards research and development. The partnership will see the development of real-time sensors for tracing red meat exports from farm to fork, new frameworks to assess risks for exporting red meat into new markets, and critical new tools for measuring and reporting on livestock wellbeing.

Ending plastic waste

In March 2022, we launched the Ending Plastic Waste (EPW) Mission with a goal for an 80 per cent reduction in plastic waste entering the Australian environment by 2030.

An initial $50 million has been funded through contributions by CSIRO, industry, government, universities and other organisations to change the way Australia makes, uses, recycles and disposes of plastics.

The mission is developing targeted solutions across the entire plastics supply chain, with a focus on transforming plastic waste into a commodity. This will support economic growth and jobs for Australia and realise the potential of circular economy plastic initiatives for recycling, which is expected to provide US$67 billion in value globally by 2025.

Our research includes revolutionising packaging materials and waste systems; best practice for the development and implementation of standards; effective solutions for recycling; analytics and ML to inform decision making; and creating behaviour change.

Our research extends beyond our domestic shores, with our tools and capabilities being applied in the Indo-Pacific region. We successfully launched the Plastics Innovation Hub Indonesia, with other hubs expected to launch in Vietnam and across the region in the coming year. This will establish an innovation ecosystem and deliver relevant and high-tech solutions to tackle plastic waste in the region.

We have committed to reducing Australia's plastic waste by 80 per cent by 2030, pictured is Dr Deborah Lau who leads our Ending Plastic Waste Mission by using science and technology to combat new ways to re-use plastic waste.

Empowering tomorrow's science-driven industries

Science-driven innovation can solve real-world challenges, create companies and jobs, and generate prosperity for the nation, but we can only realise these opportunities through an innovation-ready workforce and access to cutting-edge facilities.

Our national labs around the country are open to partners in industry to use, working with our researchers to build capability, commercialise concepts, create jobs and deliver positive impact for our communities. We work with partners in government and industry to build capability and respond to emerging threats and opportunities.

New technologies to fight bushfires

Rural fire control rooms around Australia need predictive tools to assess where a bushfire will be ahead of time. These tools can aid the safe and effective deployment of fire crews and advice to communities. We partnered with the NSW Rural Fire Service to develop an advanced model for predicting the speed and behaviour of forest fires.

The Vesta Mark 2 model, the latest tool to help save lives and properties during bushfires, was rolled out nationally in the 2021–22 summer. It is a mathematical description of how a fire responds to environmental conditions to identify threats, issue warnings, signal evacuations, and plan fire suppression actions. Vesta 2 was built using analysis of the most extensive set of data gathered from observations of large high intensity experimental fires and wildfires, collated from around the country over the past 40 years.

In March, we opened the new National Bushfire Behaviour Research Laboratory in Canberra, housing the Pyrotron and the Vertical Wind Tunnel (VWT). These instruments aid the study of the behaviour of bushfires and development of systems to better predict their spread and behaviour, as well as help fire agencies on the ground better prepare for and manage bushfires. Read more about the Laboratory and these instruments at page 122.

The Pyrotron is a 29-metre-long combustion wind tunnel designed to investigate the mechanisms of flame propagation in bushfire fuels such as grass, forest litter and shrubs, under a broad range of burning conditions including those of an extreme fire danger day. Factors such as wind speed, fuel type and structure, fuel load and fuel moisture content can be precisely varied or strictly controlled.

The VWT is designed to study the combustion and aerodynamic characteristics of embers formed by burning bark and other materials. Embers ignited and blown ahead of a bushfire often start spotfires which are a main cause of bushfires escaping containment and threatening lives and property.

These tools and models are critical to our understanding and management of one of Australia's most dangerous natural phenomena. Our extensive experience in bushfire behaviour and suppression helps train staff in all state agencies in fire behaviour and prediction to help improve the safety of our communities. The new bushfire lab is available to organisations working to better understand fire behaviour and its impacts.

Members of the Bushfire Behaviour and Risks team, Matt Plucinski, Stuart Sadler and Andrew Sullivan, prep the Pyrotron for the demonstration burn at the opening of the National Bushfire Behaviour Research Laboratory at our Black Mountain site in Canberra.

Protecting Australians from emerging health threats

COVID-19 is not our only health and biosecurity threat. We have deep expertise, strong partnerships and world-class facilities to tackle a range of emerging and existing biosecurity challenges.

We remain at the forefront of new virus threats and vaccine programs through our adoption of a 'One Health' approach. This approach considers human, animal, and environmental health together, recognising that 70 per cent of emerging infectious diseases in people originate in animals. Our researchers and our Level 4 high-containment facility, the Australian Centre for Disease Preparedness (ACDP) in Geelong, Victoria, are central to protecting Australia from biosecurity and bioterrorism threats. ACDP's work to help eradicate mosquito-borne diseases and new virus threats is detailed on the next page.

Eradicating disease-carrying mosquitoes

Over 40 per cent of all people are at risk of contracting mosquito-borne diseases. In Australia, several native and invasive mosquito species are responsible for spreading infectious diseases like dengue, which affects around 390 million people globally each year. The Aedes aegypti mosquito is the main transmitter of the dengue, chikungunya and Zika viruses. An invasive species, this mosquito is present in Queensland, the Northern Territory, and the neighbouring Torres Strait Islands.

Another mosquito-borne disease, Japanese encephalitis, can infect pigs, waterbirds, humans and horses. It occurs throughout most of Asia and parts of the Western Pacific, including Papua New Guinea, and is the most common cause of human viral encephalitis in Southeast Asia. Recently, our Australian Centre for Disease Preparedness in Geelong, Victoria conducted diagnostic testing on samples from a property in Southern Queensland where an outbreak occurred in early 2022.

Our researchers have spent years understanding mosquito behaviours to better protect Australia and its people.

In 2017–18, we partnered with the University of Queensland, Verily Life Sciences, QIMR Berghofer Medical Research Institute and James Cook University to undertake a landmark trial to suppress Aedes aegypti mosquito populations in Northern Queensland. The trial involved releasing 3 million sterilised male Aedes aegypti mosquitoes in the town of Innisfail, across 3 trial sites over a 20-week period during the summer of 2018. The sterile male insects search out and mate with wild females, preventing the production of offspring. Scientists returned to the region the following year and found one of the trial sites, Mourilyan, was almost devoid of mosquitoes.

The Japanese encephalitis virus is spread by the bite of infected Culex species mosquitoes, predominantly *Culex annulirostris*. Pictured here is a specimen of *Culex annulirostris*, from CSIRO's Australian National Insect Collection.

The research was published in the Proceedings of the National Academy of Sciences of the United States of America in October, and marked the first time in the Southern Hemisphere that researchers have successfully employed what's known as the sterile insect technique.

This technique could also be used to remove the virus-transmitting Asian tiger mosquito, Aedes albopictus, which is now established at Australia's doorstep in the Torres Strait Islands. Techniques from the trial are currently being used to support CSIRO-led mosquito suppression programs in French Polynesia and the Hunter region in New South Wales, further protecting the health security of our region.

We are exploring the potential to make this approach more cost-effective and suitable for the climates of less-developed countries that suffer most from mosquito-spread diseases. We are also contributing to several government committees and advisory groups, providing expert scientific advice to animal health working groups to support them in mosquito-borne outbreak management responses.

Understanding space to improve life on Earth

Our space and astronomy research evolved over 75 years, enables humanity to better understand the Earth and the Universe and contributes to solving the greatest challenges and building future space industries.

This year, we have met new milestones in harnessing Earth observation data gathered by satellites to inform policy, manage natural environments, and generate agricultural and industrial development opportunities. Our world-class facilities both push the boundaries of new research and apply modern techniques to test established knowledge. Together with our partners, including the Australian Space Agency, Australian businesses and international agencies and researchers, we are scanning the skies to make life better on Earth.

Exploring new opportunities in Earth observation

Earth observation satellites are central to the lives of Australians – from forecasting the weather and responding to natural disasters to managing the environment and supporting farmers.

In July we began operating Australia's 10 per cent share in the NovaSAR-1 Earth observation satellite as a national research facility so Australian researchers can apply to task the satellite. Over 250 users from across the globe are registered with the NovaSAR-1 data hub. Using a special type of radar, the NovaSAR-1 satellite can take images of the Earth through all weather conditions, including heavy cloud and smoke, offering a valuable data advantage to the many industries now harnessing the estimated $2.5 billion in economic benefits from the Earth observation sector.

We reached a milestone in our efforts to further develop the nation's sovereign satellite capability through our partnership with the Centre for Appropriate Technology (CfAT), Australia's first and only Aboriginal-owned-and-operated ground segment service provider. The ground station has successfully downlinked data from the satellite, marking the first time Australia has managed its own source of Earth observation data, contributing to the growth of the nation's space industry.

Our role with the new National Space Mission for Earth Observation (NSMEO) will build on insights gathered through operating NovaSAR-1. The first phase of the NSMEO program will see Australia design, build, and operate 4 new satellites. Led by the Australian Space Agency, we will support the design, technical specification and calibration of the satellites. A new satellite data hub is being designed, built and managed to make the data collected by the satellites accessible to end users. A global science team will maximise value and support key applications from the satellite data. To further support the NSMEO we will lead the development and maintenance of a national network of several new ground-based satellite calibration and validation sites across Australia. This infrastructure network will support domestic and international operators to calibrate their satellites and verify the data they collect to ensure its accuracy.

These new initiatives demonstrate the Australian Space Agency's Earth Observation from Space Roadmap 2021–2030 in action, setting the foundation for more complex space missions in the future while growing the Australian space industry towards achieving the Space Agency's goal of creating 20,000 new jobs by 2030.

Artist's impression of the NovaSAR-1. Credit: SSTL.

Part 3

Annual performance statements

Introductory statement

The CSIRO Board, as the accountable authority of CSIRO, presents the 2021–22 annual performance statements as required under s39 (1) (b) of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act). These annual performance statements are based on properly maintained records, and accurately present CSIRO's performance in accordance with s39 (2) of the PGPA Act.

Delivering on our purpose

Our overarching outcome is to produce innovative scientific and technology solutions to solve national challenges and create opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.

Our Corporate Plan objectives help us deliver on our purpose and respond to the internal and external environment.

Our Enabling Capabilities, which enhance and support delivery of our 3 objectives, are reported on after Objective 3, see page 100.

OBJECTIVES	STRATEGIC OUTCOMES
1. Conduct and encourage the translation of Australia's world-class scientific research into impact	Deliver impactful solutions at scale through leading science and technology, collaborative relationships and differentiated capability
2. Create and manage Australia's national laboratories	World class laboratories and collections led and shared with the research community and the public to drive innovation
3. Stimulate innovation for Australian industry, academia and government	Increase the rate of research translation in the innovation system programs and through investments that create new ventures and other outcomes to deliver impact for the nation

Objective 1

Conduct and encourage the translation of Australia's world-class scientific research into impact

Outcome

Deliver impactful solutions at-scale through leading science and technology, collaborative relationships and differentiated capability.

We deliver on this objective primarily through our Business Units, Missions and Future Science Platforms.

Missions

Our Missions program draws on our multidisciplinary science and research, and our track record of taking research through to impact, ensuring we focus on the issues that matter the most and affect our quality of life, our economy and our environment.

Missions tackle big, multi-faceted problems by bringing together research agencies, universities, industry, government and community to work collaboratively on outcomes that lead to positive benefit, new jobs and economic growth.

They are explicitly directed at solving the most urgent and complex aspects of our national challenges, guided by big, bold and inspiring goals.

They begin as CSIRO Missions but due to their scale, ambition and collaborative nature, these missions are being co-developed with partners in Australia and overseas to achieve impact well beyond our organisation.

Missions have the potential to shape or create new markets, bringing in new and existing players: citizens, customers and companies to work together to achieve outcomes.

We are directing $100 million annually to the co-creation of missions, working with the brightest minds across the research sector and industry to help Australia achieve these outcomes.

5 missions launched

$276m funding leveraged

742 mission-aligned projects

Hydrogen Industry

Launched: May 2021

Goal: A globally competitive Australian hydrogen industry in 2030 by lowering the cost of clean hydrogen to under $2 per kilogram.

Drought Resilience

Launched: September 2021

Goal: Reducing the impacts of Australian droughts by 30 per cent by 2030.

Future Protein

Launched: September 2021

Goal: Leverage increasing global demand for high quality protein to create new Australian protein products and ingredients that earn an additional $10b in revenue by 2030.

Trusted Agrifood Exports

Launched: September 2021

Goal: Increase the value of Australian food export premiums by $10b by 2030, by building trust in the safety, quality, and provenance of our agrifood.

Ending Plastic Waste

Launched: March 2022

Goal: 80 per cent reduction in plastic waste entering the environment by 2030.

Agriculture and Food Team Leader, Dr Lingling Gao, with lupin seedlings. The Lupin Breeder's Toolbox team forms an important part of CSIRO's Future Protein Mission, which aims to meet the growing demand for high-quality protein to feed the growing world population.

Mission: Roadmap to put uniquely Australian protein on the global menu

A roadmap we developed in March identified new opportunities for Australia to produce a wide range of high-quality protein products to feed the world's growing population, capturing an additional $13 billion market opportunity for all types of protein.

With an expected 2 billion extra people on the planet to feed by 2050, coupled with changing tastes and dietary preferences, the world is going to need to produce more protein, from more sources and more sustainably.

Unlocking technology-led growth opportunities for Australia.

Developed with key government and industry stakeholders, the report 'Protein: A Roadmap for unlocking technology-led growth opportunities for Australia' identified that Australia is well-positioned to capitalise on the growing protein opportunity to become a global leader through the expansion of established products and markets, and the sustainable development of novel and differentiated protein products. Underpinned by extensive consultation, economic analysis and world-class expertise, the Roadmap identified 5 strategic science and technology focus areas and 5 ecosystem priorities to guide industry activities and development.

Australia could turn plant-protein commodities, like chickpeas, into higher value ingredients onshore.

Science can help Australia grow higher protein crops, like soybean.

The report focused on dietary protein and investigated industry opportunities that span animal, plant and non-traditional protein production systems. It found that demand for protein is significant enough for all of these complementary protein sources to thrive in Australia. Ten industry growth opportunities were identified that combine these various protein sources: integrity systems in the red meat sector to help verify the origin of production, support compliance, prevent risks and support research; expanding Australian red meat exports into new geographic markets; plant-based protein ingredients; crop-breeding and pre-breeding, turning lesser cuts of red meat into value-added co-products, such as protein powders and nutraceuticals; insect protein sources for food and feed; precision fermentation and cultivated meats.

The report received strong interest from across industry, with a well-attended webinar and panel discussion alongside strong media coverage.

The Roadmap will be used to prioritise the strategic focus areas and activities of our Future Protein Mission. Government and industry sponsors of the Roadmap are also actively aligning their ongoing strategic activities and investment (with the Future Protein Mission) to drive change and industry development.

We are continuing to undertake targeted engagement activities to help communicate the findings and stimulate further industry activity and growth.

Future Science Platforms

A key mechanism to solving the greatest challenges is our investment in cutting-edge, transformative Horizon 3 research.

Our Future Science Platforms (FSPs) are multidisciplinary investments in exploring future science that are reinventing existing industries, creating new industries for Australia and providing a better future for us all.

224 CERC Fellows

1,010+ publications

51 new invention disclosures

31 new patent filings

Outcomes achieved since 2017 for the FSP program

Deep Earth Imaging
2017–24
Imaging, conceptualising and predicting location and character of the Earth's deep resources

Environomics
2017–25
Using genomics to reinvent how we measure and monitor ecosystems

Responsible Innovation
2017–25
Delivering responsible science and technology for all Australians

Precision Health
2018–24
Transforming Australia's health

Hydrogen Energy Systems
2018–26
Sustainable hydrogen production, transport and use

Space Technology
2019–25
Growing Australia's space capabilities

Artificial Intelligence and Machine Learning
2019–23
Data science for artificial intelligence and machine learning technology development

Entering their next phase

Active Integrated Matter | 2017–22
Where material things meet the digital world

Synthetic Biology | 2017–22
Establish the next generation of synthetic biology technology and leaders

Probing Biosystems | 2017–22
Real-time interrogation of living biological systems

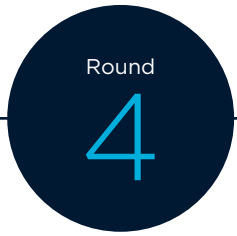
Digiscape | 2017–22
Harnessing the digital revolution for Australian farmers and land managers

FSPs invigorate and energise a culture that is excited to take on tough challenges and to push the boundaries of what we think is possible. Through FSPs we're growing the capability of a new generation of researchers and allowing Australia to attract the best students and experts to work with us on future science.

Since 2016, we've invested in 20 areas of promising new science and engineering under our FSP Program. Together with our partners, we've developed new technologies and platforms that are changing the way we live.

As each FSP reaches the end of its planned funding, the best technologies and capabilities transition into our Business Units, moving to a new phase of development, or are adopted by research partners or follow another pathway to commercialisation. This pipeline allows us to introduce new FSPs to tackle the next emerging Horizon 3 challenges.

To date, we have invested $425 million in FSPs. This year, the program total annual investment was $86.6 million.



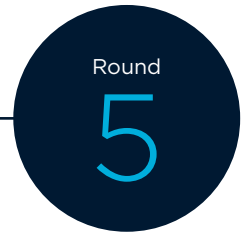
Quantum Technologies
2021–26
Translating fundamental quantum research to address real world problems

Microbiomes
2021–25
Interconnectivity of microbiomes across systems for One Systems Health

Valuing Sustainability
2021–26
Measures to underpin sustainable innovation for industries and communities

Autonomous Sensing
2021–26
Combining fundamental sensor research and autonomous engineering

Collaborative Intelligence
2021–25
The science to help people and machines be better together



Revolutionary Energy Storage Systems
2022–27
New management systems to meet future energy needs safely, efficiently and sustainably

Permanent Carbon Locking
2022–27
Radical innovation across carbon capture and carbon storage science

Immune Resilience
2022–26
Harnessing immune responses for better protection against diseases and emerging health threats

Advanced Engineering Biology
2022–27
Supercharging biotechnology delivery to support food security, health and sustainable manufacturing

Future Science Platform: Sowing the seeds for a bioeconomy boom

The 2016 launch of our Synthetic Biology (SynBio) Future Science Platform (FSP) aimed to deliver a bold new vision and strategy for Australia – to create new industries and reinvent old ones. When global interest in the 'fourth industrial revolution' was at an all-time high, synthetic biology presented an exciting opportunity, with transformative potential in applications as diverse as manufacturing, human health, agriculture and protecting ecosystems.

Supported by an initial investment of $13 million, the new FSP positioned Australia to enter the global arena and nationally to develop sovereign capability.

But a critical challenge lay ahead: a fragmented domestic synthetic biology community, combined with low overall public awareness of synthetic biology applications, contributed to some uncertainty in how the public, and consequently investors, would embrace new innovations. The FSP was tasked with building a strong local synthetic biology ecosystem that would allow such solutions to flourish. In part, this was enabled by its decision to fund high-risk high-return projects both within CSIRO and in the university sector. The aim was to develop the next generation of scientists ready to embrace the SynBio revolution.

The SynBio FSP has a network of 45 partners, including 24 Australian universities and 17 international institutions. As well, from the outset, responsible innovation and public engagement were identified as key priorities in establishing the social license to operate in this area of breakthrough science.

An early achievement of the FSP was establishing a globally linked Community of Practice. Further targeted engagement with state and federal governments and industry included relationship building with key players in the Queensland sugar industry and delivery of a suite of targeted workshops. This helped cement the SynBio FSP as a catalyst for innovative solutions to pressing problems.

A dedicated team of social scientists embedded in the program published a world-first baseline survey of public acceptance of synthetic biology-enabled technologies in Australia, laying the groundwork for scientists across the country who are developing solutions to some of our most pressing problems including environmental interventions on the Great Barrier Reef.

Through a nationally and internationally coordinated effort, the SynBio FSP has fostered a cultural shift in development of a vibrant landscape for a bioeconomy. Today, Queensland is globally recognised as a vibrant landscape to invest, attract talent, and grow synthetic-based industries. This is partly due to continued high level engagement with the Queensland Government, and understanding the needs of US-based synbio start-up companies, such as access to feedstock, ports, transport, large-scale contract manufacturing facilities, R&D tax incentives and a secure intellectual property environment.

At a commercial level, the program's success is evident in the exponential growth in venture capital investment into new seed companies, from zero in 2016, to over 20 in 2022. The FSP has enabled 4 patents, one proprietary algorithm, 3 trade secrets and one lapsed patent, plus one provisional patent in development.

Through our work in Synbio FSP research in locating disease biomarkers, we have developed a non-invasive diagnostic test that can detect Alzheimer's disease risk earlier through biomarkers in saliva, which is the easiest tissue for people to collect themselves for testing and is the least explored for biomedical purposes.

Our incoming Advanced Engineering Biology FSP reflects a heightened commitment to Australia's bioeconomy, which has been forecasted to unlock up to $27 billion in annual revenue and 44,000 new jobs for Australia by the year 2040.

Future Science Program: Autonomous hyperspectral imaging of marine ecosystems

The Great Barrier Reef (GBR) is the largest coral reef ecosystem in the world renowned for its biodiversity. It is also fragile and has been massively impacted by climate change and human activities.

To protect and restore the reef, it is vital to acquire close-range and detailed observation to monitor human and climatic-induced change and recovery due to interventions to address these. However, habitats like coral reefs are one of the most challenging environments to capture data and underwater data collection procedures are costly and inefficient.

The Active Integrated Matter (AIM) Future Science Platform (FSP) launched in 2017 to lead ground-breaking advances at the interface of big data, advanced autonomous systems and materials science. As part of this FSP, the Coral Reef Monitoring and Response testbed, led by Data61, was created to improve monitoring in coral reef habitats by developing technologies that could support scientists to better handle underwater research collection challenges.

The testbed developed a cutting-edge automated underwater optical platform, Corycaeus, to help scientists better understand and monitor coral reefs and aquatic environments. Corycaeus, a self-powered fully automated watertight system capable of recording synchronised images and sensor data up to 11 frames per second, focuses on in-situ image data collection in underwater environments using multispectral and colour cameras.

This versatile optical instrument platform features onboard devices and sensors that can be easily adopted to suit various requirements. Depending on tasks and target environments, Corycaeus can switch its deployment form between hand-held, ROV-mounted, and diver wearable devices.

Our team also provided computer vision models and algorithms to help answer questions about super-resolution for spectral images, multispectral image colour prediction, and water column removal.

An independent analysis by RTI International quantified the benefits from the preservation and expansion of the reef cover, tourism sector and ecosystem services, and projected that the total impact to the GBR would be between $58.2 million and $356.2 million. RTI found that, across the scenarios, preserving and expanding reef cover yielded the highest potential benefits, ranging from $39.5 million to $243.6 million in undiscounted terms, or nearly 70 per cent of the total value. The benefits from tourism vary widely across scenarios, whereas the benefits from ecosystem services stay relatively similar.

Beyond coral reef monitoring, we believe these technologies are applicable in general monitoring of aquatic environments, from fisheries management to coral reef health to improved human health and safety.

Heart Reef in the Great Barrier Reef, Whitsundays.

Corycaeus autonomous underwater imaging platform.

Future Science and Technology

In 2020, we released a 'Future Science and Technology (Future S&T)' directions document aimed at providing guidance on the research and technology required to deliver our long-term S&T strategy.

Cross-cutting capabilities: Several areas were identified as S&T cross-cutting capabilities (CCC) with the goal of establishing groups of like-minded people – whose skills 'cut across' scientific fields – to come together and share knowledge and skills through Communities of Practice (CoP), for example, engineering. These groups connect research areas of the organisation to solve big problems through collaboration, problem sharing and solution creation. Nine groups have been established and this collective now envelopes all Business Units and over 1,000 staff. Numerous organic connections have been made and novel and creative solutions developed as a result.

Labs of the Future: So we keep pace with the inevitable changes in the use of laboratories and scientific equipment, Future S&T facilitated discussion forums with our people to understand their individual and collective needs. Then we brought together experts from around the world to share the latest developments in collaboration methods, robotics, automation and remote access. The Labs of the Future Symposium welcomed over 400 delegates and 30 speakers. Information from this symposium will inform the future of our laboratory spaces.

Preparations at the site started for the new National Collections Building at Black Mountain in Canberra, which will house around 13 million insect, wildlife and botanical specimens. The new shared national labs have been designed around workflows, efficiencies of scale and new equipment, and will enable opportunities for cross-collection collaboration. The building, jointly funded by CSIRO and the Department of Education through the National Collaborative Research Infrastructure Strategy (NCRIS), will include modern, flexible and fit-for-purpose digitisation facilities that will dramatically increase digital access to these important specimens. Read more about the Atlas of Living Australia and the National Research Collections Australia on page 62.

Emerging Horizons: We must remain at the forefront of understanding, and predicting, emerging and potentially transformative areas of research and development. Future S&T continues to engage widely with our people to ensure that we are abreast of emerging areas of science and remain in the optimum position to provide our science, leadership, and solutions.

All our Business Units and over 1,000 staff are connecting research areas through Communities of Practice.

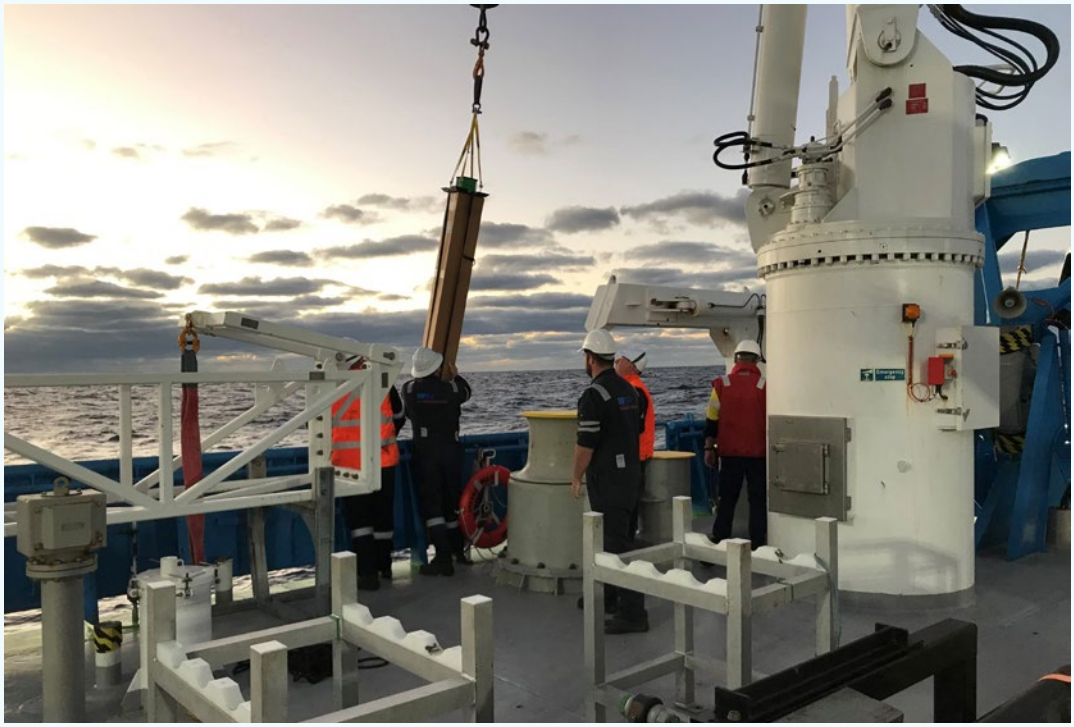
Artist's rendition of the new National Collections Building. Credit: Hassell.

World's first remote-controlled device to deploy floats from ships

The Engineering cross-cutting capabilities, challenged their Community of Practice to create a 'great bit of kit/hardware/code' for up to $1,500, resulted in the world's first remote-controlled device to deploy floats from ships. Called Argos, this fleet of robotic floats collect temperature and salinity measurements from the world's oceans and adjust their buoyancy to collect data at various ocean depths. Argo floats have revolutionised our understanding of the broad scale structure of the ocean and have provided more high-resolution ocean data than has ever been collected by traditional ship-based hydrography.

Experimental Scientist Pat McMahon and his team identified an issue with how the expensive floats were deployed that resulted in them being damaged and rendered useless. The team's device was developed, enhanced and trialled on land, before being successfully used on board the French icebreaker *L'Astrolabe*. The deployed float device continues to perform well in the Southern Ocean.

With a small cash injection, and the ingenuity and passion of our people, amazing achievements are possible.



The CSIRO Argo device being deployed and tested from the French icebreaker *L'Astrolabe*.

Delivering benefits to Australia

Impact

Each year CSIRO commissions impact case studies that are used to represent the value of our research activities and national facilities, collections and services programs.

During 2021–22, we completed the targeted 25 impact case studies across our portfolio, including hydrogen battery start-up Endua, see page 74, and TranspiratiONal, see page 194.

Our approach for quantifying our return on investment involves comparing the estimated benefits of our research (as identified in our impact case studies) to the costs of research for a specific time period (recent years' actuals plus up to 10 years of projections). This creates the equivalent of a moving average return on investment that places less emphasis on historical patterns and more emphasis on current value generation. The new method was developed by RTI International, an independent non-profit research institute. We are continuing to follow this approach which delivers a more accurate representation of our value.

During 2021–22, we commissioned an external analysis of 170 impact case studies covering CSIRO research, technology and services initiated within 25 years (i.e. between 1997 and 2022). This assessment provides an estimate of the overall value we deliver to the nation, mainly drawing upon the impact case study findings. Our most recent finding estimates an 8.4:1 return on investment, indicating that for every $1 invested in CSIRO, at least $8.40 in value is returned to the Australian people. Our ability to communicate the value of CSIRO increases as more studies are added to the portfolio. The 2022 portfolio benefit-cost ratio (BCR) of 8.4 is higher than the 7.6 BCR in 2020. The increased BCR indicates that the newly added case studies reflect higher returns to the Australian people from our activities. It is important to note that this BCR represents a lower bound estimate and does not include unmonetised impacts such as our contribution to the knowledge base and awareness of science and innovation across Australian society, our education programs, and the role we play in conservation and culture.

Our research portfolio and its alignment to national socioeconomic objectives

Figure 3.1 shows the contribution of our research towards socioeconomic outcomes during the year. Our total research and development investment during the year was nearly $1.3 billion.

Ensuring customer satisfaction

Our customer profile and composition

We survey our customers annually. This year, CSIRO surveyed 1,565 customers with a 10 per cent response rate. Eighty-three per cent were Australian customers with nearly half from industry, including large and small private enterprises. Twenty-eight per cent were from Australian Federal and State Governments and universities.

Net Promoter Score (NPS) is a key performance metric of our performance analysis. It is a global, industry standard score and a measure of advocacy and loyalty. The purpose of the customer satisfaction survey is to understand customer needs, their views on how we are performing and their experience with CSIRO. It is part of our ongoing commitment to strengthen relationships with customers and improve the way we deliver solutions to better meet their needs. We have exceeded our target (of +40) in the last 4 years, and have attained a score of +47 this year (see Figure 3.2).

This year, favourable responses remain high, with minor differences from last year, across all aspects of Action and Experience. We measure 4 dimensions of customer satisfaction:

- Experience: measures perception of responsiveness, reliability, staff competence and empathy
- Satisfaction: measures overall satisfaction with science quality, project delivery and value for money
- Commitment: captures emotional engagement of customers, specifically regarding trust and commitment
- Retention: rates future behaviour in relation to remaining with CSIRO, increasing engagements, engaging with other areas of research and likelihood to recommend us to others.

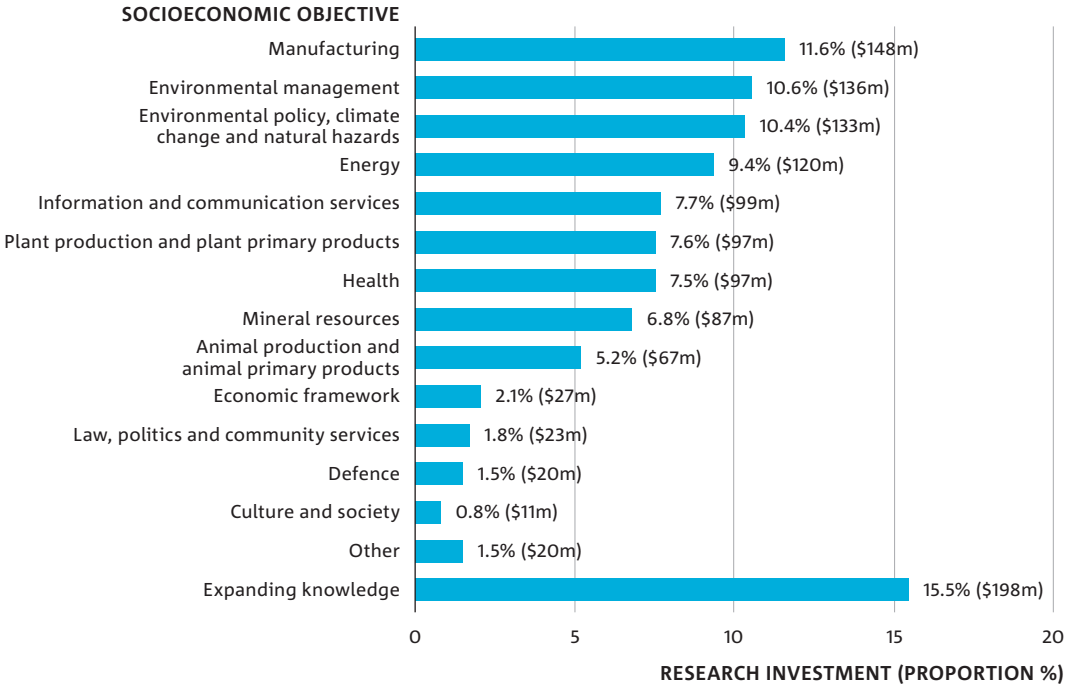


Figure 3.1: Our research investment (proportion % and $ spend) by socioeconomic objective

Notes: Other category includes Indigenous, transport, commercial services and tourism, construction and socioeconomic objectives. Investment includes all BUs and National Facilities excluding CSIRO Services. Expanding Knowledge category mostly includes the R&D that does not have an identifiable socioeconomic objective, which is usually the case for pure basic research and strategic basic research type of activity classification.

This year's survey showed 78 per cent of customers are highly likely to stay with CSIRO. Consistent with the past 4 years of surveys. Thirty-nine per cent are willing to engage other areas of our research, and 50 per cent say they are highly likely to increase their engagements, which is a significant increase on last year. Overall satisfaction, at 77 per cent favourable, has been improving year on year since 2016.

Customers rated us higher compared to last year on our reliability, including quality and consistency of service delivery and rectifying issues. However, many are still concerned about the timeliness of our delivery and availability of staff. Their perception of our responsiveness is down, yet customers say we are willing to help and have great impact on their business.

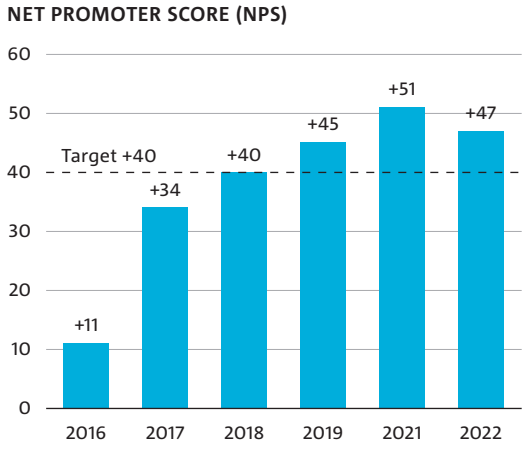


Figure 3.2: NPS trend since 2016

Note: Data not collected in 2020.

Trust remains high, with customers valuing their collaboration with us as a trusted partner. Most commend our world-leading expertise, integrity and high-quality work. Our customers see us as a professional organisation but some say we should improve the speed of our contractual and legal processes, as well as our administrative procedures for branding and intellectual property.

From customer comments, the key areas that worked well including our collaboration and partnering, extensive knowledge and experience, professionalism, communication and quality of service.

Science excellence

The high quality of our research is central to the value we provide to the nation. It is the foundation that enables us to partner with industry, government and society to achieve impact for Australia.

Disseminating excellent science demonstrates how we deliver on our purpose to solve the greatest challenges through innovative science and technology. The conduct and dissemination of strong science not only indicates high-quality scientific capability within our organisation but also drives profound real-world impact.

We deliver on our purpose through innovative science and technology.

Excellent science and citations analysis

Research is recognised as excellent, referenced and used by academia

A standard way of evaluating scientific performance is to look at the publications produced from research and how often they have been cited by others. We look at how frequently our work is cited and normalised for subject patterns and the age of the material. This Normalised Citation Impact (NCI) is a standard indicator and allows for global comparison with other research organisations.

Our citation levels are significantly higher than global average. Our NCI performance in the fields for which we deliver crucial impact remained strong; we are consistently ranked in the top 0.1 per cent of institutions globally in the fields of Agricultural Science, Environment/Ecology, Geoscience, and Plant and Animal Science based on total citations over the last 10 years. We have held this position in these 4 fields for 16 years – for as long as we have tracked this performance. More than half of our publications appear in these 4 fields. We are also consistently ranked in the top one per cent of global institutions in 15 of 22 fields.

Figure 3.3 shows 5 of our major fields of focus, how strong our publications are for each and how much we contributed to Australia's output. For these 5 fields, we author around 10 per cent of the country's publications, indicating a core role in the nation's research activities.

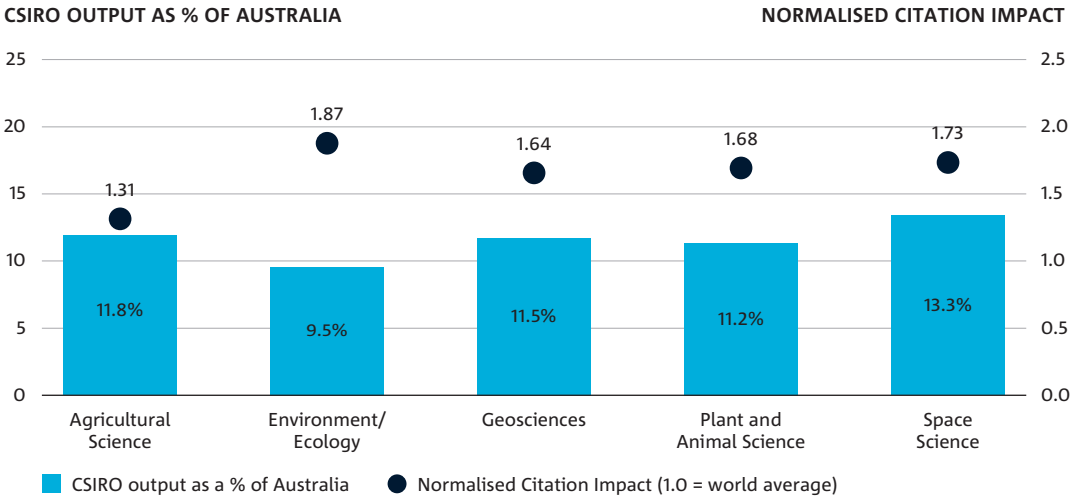


Figure 3.3: Our top research fields and their citation impact 2021–22

Reporting and Improving Science Excellence

CSIRO's science excellence must be strong enough to deliver the real-world impact that is our goal as an organisation. We need to perform at least at the level of similar, impact-driven peers. This year, we launched the Reporting and Improving Science Excellence (RISE) project, which benchmarks each Business Unit's key fields against lists of peer institutions working on similar problems and with similar objectives. This segmentation, which overcomes variation in citation patterns among and within fields, allows us to better evaluate the level of science excellence required to underpin the delivery of profound impact.

In total, there were 23 units of assessment, each representing benchmarking of a field within a Business Unit. In 11 units of assessment, the Business Unit was ranked in the top 25 per cent of peers, but we consider performance in the top 75 per cent of peers as meeting the required level of science excellence. We met this threshold in 20 of 23 units of assessment this year. Our target is to meet the threshold in at least three quarters of units of assessment, with the target rising to 100 per cent of units of assessment in the next 6 years.

Research publications

As shown in Figure 3.4, our publication output is steady, with 3,412 journal publications last year.

NUMBER OF PUBLICATIONS

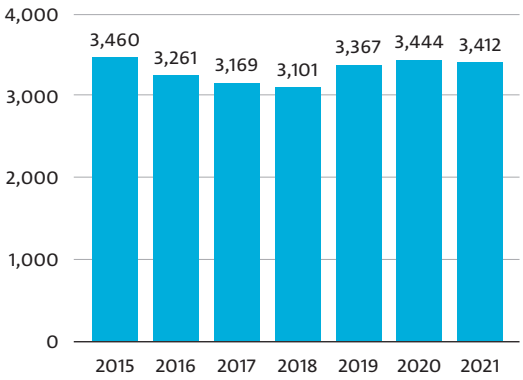


Figure 3.4: Our journal publication output

The earlier decline was due to the decrease in our research staff in previous years, lagging that change because of the time it takes to conduct and publish research, see Table 4.1.

While the bulk of our publication output takes the form of peer-reviewed journal articles, we produce conference presentations and papers, books and online materials. We also author and release numerous client and technical reports.

Commercialising our research outcomes

Leveraging our intellectual property to create impact

Central to the translation of our research is our ability to effectively create and leverage our intellectual property (IP).

At the end of June, we had 647 active patent families, 38 Patent Cooperation Treaty applications, 11 patent direct filings, 261 trademark families and 77 Australian plant breeder's right (PBR) families. There was a consistent level of new patent and PBR filings during the year and we also saw an increase in design filings. These are good indicators of existing technologies making their way through the pipeline, and it highlights our continued focus on our commercialisation strategy.

We filed 48 new provisional applications, which is a slight decline from 52 reported last year.

Industry is adopting our solutions

Technology licences are used as key indicators of research and development uptake by customers and collaborators. A total of 594 active licences were recorded, from which 311 have generated revenue returns to CSIRO, compared to 300 in last year. In 2022, the total licence fees and royalty revenue increased to $49.7 million compared to $39 million in 2021, an increase of nearly 27 per cent.

While gains arise from increases in equity holdings, average return for royalties and licensing revenues over the past 3 years to 2022 was $39 million per year, which is an increase of 14 per cent over the average for the 3 years to 2021.

Table 3.1: Our intellectual property portfolio

IP CATEGORY	SUB-CATEGORY	2018–19	2019–20	2020–21	2021–22
Patents	Provisional applications	55	64	53	48
	Patent Cooperation Treaty (PCT) applications and direct filings	53	48	60	49
	Patent families	679	675	658	647
	Granted cases	2,244	2,233	2,199	2,499
	Live cases	4,065	3,997	3,754	4,035
Trademarks	Australian	273	271	266	261
	Overseas	52	49	46	48
Plant Breeder's Rights	Australian	59	59	65	77
	Overseas	20	23	22	19
Registered Designs	Australian	2	3	14	15
	Overseas	5	6	17	15

Commercialisation strategy

Multiple commercialisation pathways link our research to industry. A number of these pathways see us take out an equity stake in the company. We may spin out new technology where we recognise its value and bring together commercialisation resources, management teams and investors to create and support entirely new companies that create new jobs and value for industry.

Commercialising our IP

We make our IP and research and development (R&D) capabilities available to early-stage companies that have limited resources. In these situations, we assign our IP to the new company in exchange for an ownership stake or shares as payment for our R&D services. These arrangements can help a start-up company preserve their cash resources, which increases the likelihood they will successfully reach their goals.

Capital investment

In the past 12 months, our portfolio companies have reached key R&D milestones, progressed new technologies to market and attracted significant new capital investment.

At the end of June, we held investments in 6 ASX-listed companies, 37 private companies and 3 early-stage investment funds (including the CSIRO Innovation Fund managed by Main Sequence). The combined value of these holdings is shown in Note 2.1C of our audited Financial statements in Part 5.

Working with industry on technology transfer to deliver national impact

The combined successes of our portfolio companies throughout 2021–22 point to the triple bottom line impacts that are being produced by the commercialisation of our technology. Their achievements include:

- **Chrysos Corporation Limited** – commenced trading on the Australian Securities Exchange (ASX) on Friday 6 May under the ASX ticker C79. Read more about Chrysos on page 53.

- **Saluda Medical** – a global neuromodulation company leading the development and commercialisation of data-driven, personalised therapies for patients suffering from chronic pain. The company's Evoke® spinal cord stimulation (SCS) system is designed to treat chronic, intractable back and leg pain, and in March 2022, Saluda announced it had secured United States Federal Drug Administration (FDA) approval for the Evoke SCS system. The company now intends to implement a controlled, limited release of the Evoke SCS system among select trial sites before initiating a full commercial release in 2023.
- **Coviu** was awarded a $6.5 million Australian Government Medical Research Future Fund Grant in November to develop, test and integrate a suite of digital tools to support transforming wound care through telehealth in aged care. The research presents an opportunity to make a difference to the health and quality of life of older people living in aged care. Over 6 million medical consultations have now been delivered using Coviu's innovative telehealth platform.

Chrysos marks significant commercial milestone

Chrysos Corporation's Australian Securities Exchange (ASX) listing was a significant milestone for the company that was only formed in 2016. Chrysos commercialised CSIRO's PhotonAssayTM technology, which is a quantitative, chemistry-free replacement for traditional methods of minerals analysis. It delivers faster, safer, more accurate and environmentally friendly analysis of gold, silver, copper and other elements in as little as 2 minutes.

When it listed on 6 May 2022, it was the largest IPO on the ASX for the calendar year, raising $183.5 million.

Chrysos already counts as customers 2 of the largest gold mining companies globally by production, and 3 of the 4 largest operators of geochemistry laboratories globally. The new funds raised are being used to further support the company's growth strategy, which is focused on deploying PhotonAssay units for customers in key mining hubs around the globe.

Dirk Treasure, Chrysos Managing Director and Chief Executive Officer said PhotonAssay represents the first major advancement in gold assaying in centuries.

"The technology offers a unique solution to a range of operational, economic and ESG challenges currently facing mining and exploration companies. We have already made significant headway in the acceptance of PhotonAssay within the gold sector, with our process being used by major laboratory services providers and gold mining companies around the world. Yet there is so much potential ahead of us for growth within our addressable market, and our continued expansion into analysis of other elements such as silver and copper.

"Listing on the ASX is an important milestone on our journey to becoming the world's leading provider of innovative assay technologies and services," Mr Treasure said.

Chrysos Corporation is one of 46 science and technology commercialisation companies that CSIRO has a direct investment in. The success of these companies enables CSIRO to re-invest into more impact-making science.

L to R: Chrysos Chairman Rob Adamson, Chrysos CEO Dirk Treasure and CSIRO Chief Executive Larry Marshall celebrate Chrysos' first day of trade on the Australian Securities Exchange.

Australia's trusted advisor

Measuring Australia's trust in CSIRO

We recognise the importance of being a trusted advisor to Australian industry, governments and the community, by providing solutions and advice based on our scientific research.

We use annual surveys to track our reputation and to measure awareness, knowledge, perceptions and trust of CSIRO with community and business audiences.

This year we conducted a Business Sentiment Survey which showed that industry awareness of the potential to work directly with us increased from 35 per cent in 2021 to 44 per cent.

Of those who are aware of our work, there has been an increase in their knowledge of CSIRO, which is correlated with trust. It also found 62 per cent of respondents have a significant or moderate knowledge of CSIRO.

The Community Sentiment Survey results showed that trust increased since last year, with a total trust score of 86 per cent combining both 'moderately and extremely trustworthy', the highest result to date. The survey results also showed that CSIRO remains the most trusted brand when measuring the 'extremely trustworthy' score, increasing 17 percentage points in the last year to 60 per cent.

Analysis of performance

Our efforts this year contributed towards delivering our outcome as detailed in Table 3.2.

Table 3.2: Summary of performance on the translation of our world-class scientific research into impact

FOCUS AREA	METRIC*	TARGET	RESULT
Delivering benefits to Australia	Demonstrated value of benefits underpinned by an increasing annual portfolio of externally validated impact case studies capturing triple bottom line impacts	Evidence of maintained or increased impact	**Achieved**: Substantial triple-bottom line benefits have resulted from our work and are demonstrated by 25 impact case studies.
Ensuring customer satisfaction	Customer Net Promoter Score (NPS) maintained with increased survey sample	NPS +40	**Achieved**: NPS +47
Disseminating excellent science	Normalised Citation Index (NCI)	NCI 1.5	**Achieved**: NCI 1.5
Industry is adopting our solutions	Mixed methods quantitative assessment of equity portfolio; 3-year rolling average of revenue from intellectual property (i.e. royalties, licensing); spin-out companies established, and the creation of new SMEs facilitated	Maintain or increase performance across each method	**Achieved**: SMEs and other companies yielded substantial returns from the commercialisation of CSIRO technology. 3-year moving average of IP revenue for this year is $39 million, an increase of 14% compared to last year.
Being Australia's trusted advisor	Business Sentiment Survey: awareness of potential to work directly with CSIRO and knowledge of CSIRO	Increase year on-year	**Achieved**: Awareness of the potential to work directly with CSIRO increased from 35% in 2021 to 44%; and those that had a significant or moderate amount of knowledge increased from 54% to 62%. Extremely trustworthy score increased from 43% in 2021 to 60% in 2022, which has been steadily increasing since 2015.

*Source: Corporate Plan 2021–22

Delivering benefits to Australia

Twenty-five case studies were completed and every 2 years we commission a report to estimate the overall value we deliver to the nation. The report this year estimated an 8.4:1 return on investment, indicating that for every $1 invested in CSIRO, at least $8.40 in value is returned to the Australian people. The 2022 portfolio benefit-cost ratio (BCR) of 8.4 is higher than the 7.6 BCR reported in the 2020 value report.

Delivering a customer experience journey across our key sectors

CSIRO works to maintain and improve customer satisfaction. Overall satisfaction (77 per cent favourable) is the highest score we have achieved since 2016 and there has been an increase each year over that time. This year, our Net Promoter Score (NPS) was +47, a good result. This KPI measure is an industry benchmark of customer willingness to recommend. In 2022, our NPS declined slightly from last year's result of +51. However, both year's scores are considered a high achievement compared to industry best practice and are above our target level. Speed of response, staff availability and timeliness of delivery are considered as possible factors for the NPS decline.

Highlighted through the customer satisfaction survey, despite a drop in the perception of us predicting their business needs, many customers cite the positive impact we have on their business, and our pragmatic, open and collaborative approach to tacking problems with innovation. Australian Private Sector customers are more likely to recommend us to others (with a higher NPS) than are our Australian Government customers. Australian customers score us higher on the NPS than international customers and Australian SMEs score us higher than Australian larger corporates.

Overall satisfaction (77 per cent favourable) is the highest score we have achieved since 2016 and there has been an increase each year over that time. We continue to work on customer issues needing improvement.

Research is recognised as excellent, referenced and used by academia

Our citation performance remained stable with an NCI value (excluding medical) of 1.50 achieving our target level for this year. This result shows our NCI is 50 per cent higher than the global average based on our publications output from 2017–21.

We continue to implement our RISE project, which benchmarks a science field within a Business Unit. Out of 23 units, 11 were assessed as being ranked in the top 25 per cent, and 20 units were ranked within the top 75 per cent which is our required level of science excellence.

Our aim is to reach 100 per cent over the next 6 years.

Science and technology is adopted, creating value for industry

Our portfolio companies achieved excellent results this year with significant milestones reached in the creation of value from our research outputs and support. Over the past 3 years, our portfolio companies have raised $909 million in capital. A share of this growth is attributed to CSIRO, recognised as $36.07 million in realised and unrealised returns to CSIRO in 2021–22.

The total IP revenue from royalties and licensing for 2021–22 reached $49.7 million which is the highest recorded in the last 5 years. During 2021–22, 311 revenue earning contacts (excluding Cotton Seed) earned over $16.7 million, which is showing a trend of recovery and slight growth over the previous 3 years, following a decline during the 2021.

The average total IP revenue from royalties and licensing over the past 3 years was $39 million per year, which is 14 per cent higher than the $34 million average for the 3 years to 2021.

CSIRO is recognised as a trusted advisor

We conduct an annual survey to ascertain industry views and as an indicator of being a trusted advisor. The positive results of this year's Business Sentiment Survey and Community Sentiment Survey indicate increasing awareness and willingness to work with us as well as increasing trust.
See details on page 54 and Table 3.2.

Objective 2

Create and manage Australia's national laboratories

Outcome

World-class laboratories and collections led and shared with the research community and the public to drive innovation.

Our key activities contribute to our strategic focus areas and provide services to the Australian innovation system and industry via:

- Australian Centre for Disease Preparedness (ACDP)
- Australia Telescope National Facility (ATNF)
- Marine National Facility (MNF)
- Pawsey Supercomputing Research Centre (Pawsey)
- National Research Collections Australia (NRCA)
- Atlas of Living Australia (ALA).

We deliver on this objective by:

- leading and operating world-class, science-ready national, landmark and global level research facilities and biological collections
- identifying research facilities needed to advance Australia and the design and creation of new national infrastructure
- providing the scientific community with access to highly specialised cutting-edge infrastructure to facilitate impactful research of national benefit through making available world-class research infrastructure on behalf of the Australian Government.

Our national labs and research facilities and biological collections deliver long-term national benefit and are accessible through merit-based assessment. Some facilities are available for use through commercial arrangements. Our facilities span from global platform such as Square Kilometre Array and landmark research platforms, including ACDP, MNF, ATNF, NRCA, ALA, and Pawsey to national digital capability and specialist national laboratories, scientific and testing equipment, and other specialist research facilities and expertise.

In March, we opened a National Bushfire Behaviour Research Laboratory in Canberra. The facility provides 2 newly developed technologies, the Pyrotron and the Vertical Wind Tunnel, to help researchers understand bushfire behaviour and manage emergency responses. Read more about the facility at pages 29 and 122.

The bushfire research facility is supported by the Australian Government and used for Next Generation Artificial Intelligence and Emerging Technologies Graduates from Australia and international locations to train and be a part of research projects we coordinate while developing on-the-job skills.

Educational programs are available for school student and tertiary students, and open access arrangements to the research data and publications generated through use of the facilities are also provided. Read more about these programs on page 86. Read more about our STEM programs at pages 86–89.

The national labs, facilities and collections that we manage receive significant government funding through the Australian Government's budget appropriation each year (see Part 1 Table 1.1). Funding is also provided from the Australian Government's National Collaborative Research Infrastructure Strategy (NCRIS) program, state governments, federal and state departments, and partnership arrangements specific to the individual infrastructure.

Strategic development

Advisory committees for specific facilities provide advice on strategic development and access arrangements where appropriate.

We provided significant advice on the 2021 National Research Infrastructure Roadmap, which sets the strategic direction and vision for Australian national research infrastructure over the next 5 to 10 years.

The National Artificial Intelligence Centre was established on behalf of the government as part of Australia's Artificial Intelligence (AI) Action Plan and Digital Economy Strategy measures. The Centre brings together partners from government, industry and the research sector to boost exploration and adoption of AI in Australia and is a focal point for international partnerships. Google Australia was announced as the first Foundation partner in February. Our Next Gen AI and Emerging Technology program was developed and called for university and industry partner applications. Twelve applications were successful involving 14 universities and 66 industry and government partners. It is expected that over 200 PhD students will be involved going forward.

With COVID-19 continuing to be ACDP's main focus, our scientists have been undertaking metabolic profiling and studies of innate immune responses, to better define the course of disease and correlates of immunity following vaccination and infection. We also contributed to studies of the susceptibility of other animals to this virus, along with the risks of transmission back to humans. Our in silico analysis of COVID-19 variants has also provided valuable insights into the evolution of this virus, along with analysis and interpretation of the complex data being made available worldwide.

In July, the MNF paused at-sea operations on Research Vessel *Investigator* to undertake a program of vessel maintenance, equipment review and enhancements, and consolidation of our COVID-19 management protocols. At-sea operations resumed in November.

NRCA, ALA and ATNF and Pawsey operated with no or very minimal disruption as significant amounts of service delivery were already available via digital access.

Our national telescope facility at Parkes has a decades-long collection of pulsar data that was used to test the theory of General Relativity and prove that Einstein was right: again. Our newest radio telescope, ASKAP, undertook its first survey of the Galactic Plane, finding 3,600 objects, many of which could be new stars or galaxies.

This year, we also began operating our share of the NovaSAR-1 Earth observation satellite as a national facility and opened a 'Moon in a room' facility for testing equipment destined for the lunar surface. Read more about this on page 63.

Other new national infrastructure developments included the launch of a new educational program at Pawsey to prepare researchers to use our next era of supercomputing as it comes online. We continued major upgrades to the Pawsey supercomputing infrastructure, facilities at ACDP and the NRCA and equipment enhancements for the MNF.

Australian Centre for Disease Preparedness

Through world-leading infrastructure, research and scientific expertise, the ACDP provides Australia's highest level of biocontainment within a purpose-built biosecurity facility. Our research and diagnostic science help protect Australia's valuable livestock and aquaculture industries, and the community, from exotic and emerging infectious diseases.

We play a pivotal role as the nation's premier one-health institute, leading preparedness and response to current and future animal and zoonotic infectious disease threats. Our scientists undertook 6 new SARS-CoV-2 projects, continuing our efforts towards the global response to COVID-19.

To facilitate impactful research of national benefit, we offer collaborative access to our biocontainment capabilities by Australian and international researchers, academics, government agencies, research organisations and industry.

In 2021, we accepted 49 new facility access applications. We also enhanced research capability and expertise through the employment of PhD graduates as CSIRO Early Research Career Fellows, and we welcomed 9 post-doctoral fellows and 14 students to train and work on site.

We are Australia's national reference laboratory for most nationally notifiable diseases providing this service for the nation's agriculture and food production industries. Federal and state agriculture departments rely on our expertise to detect and control animal diseases. Our diagnostic teams performed over 39,000 diagnostic and exclusion tests in the past year. Our experts supported emerging disease priorities in Australia and the South-East Asian region, such as Japanese encephalitis, African Swine Fever and Lumpy skin disease, which pose real and present threats to Australia.

To improve the expertise, disease preparedness and response in the region, we identified international diagnostic capacity building as a critical growth area. We partnered with Papua New Guinea (PNG) to help strengthen the country's ability to prevent and control serious animal diseases. In-country deployment of ACDP staff will provide guidance and training in field disease surveillance and laboratory diagnostics, in addition to supporting improved biosecurity practices, quality control, risk communication and emergency response. Read about the 'LabCap PNG: Holistic laboratory capacity building for Papua New Guinea' project on page 59.

Our diagnostic and scientific research is supported by highly specialised operations teams who maintain facility biocontainment, biosafety, quality assurance, training, site security and monitoring, engineering and infrastructure maintenance. Our dedicated and diverse workforce, maintains and develops core capabilities to address all aspects of infectious disease preparedness: awareness, assessment, mitigation and response.

To ensure the continuation of ACDP's infrastructure capability, the $220 million upgrade of the high-biocontainment facilities is progressing through the design phase. This work will ensure the facility continues to meet current and emerging regulatory compliance standards, while being fit for purpose, now and into the future. As part of the upgrade, engagement continues with Australian academia and industry to develop and unify the nation's sovereign capability in disease preparedness.

Strengthening Papua New Guinea against animal disease

In recent years, African swine fever virus has spread rapidly throughout much of the Asia-Pacific region. With much of the region's population reliant on small-scale farming, pigs can often be a mainstay of people's livelihoods. This is the case in Papua New Guinea (PNG) where pigs are raised for food, economic and cultural purposes.

In mid-2020, African swine fever was detected in PNG. Scientists from our Australian Centre for Disease Preparedness (ACDP), with colleagues from partner organisations, were already working in PNG to develop pilot surveillance activities for mosquito-borne diseases, funded by the Australian Centre for International Agricultural Research.

The project team was working with local organisations, PNG's National Agriculture and Quarantine Inspection Authority (NAQIA) and the PNG Institute for Medical Research, in a One Health approach that recognises the health of people, animals and the environment are interconnected.

With the detection of African swine fever in PNG, our scientists proposed expanding our existing collaborations to incorporate surveillance and testing for African swine fever. We delivered training and development activities for the establishment of field-based surveillance and for laboratory diagnostic methods, including tests for mosquito-borne viruses and more accurate tests for the detection of African swine fever.

After the success of this collaboration, in 2021 colleagues from NAQIA proposed a further collaboration to strengthen PNG's diagnostics capability for animal diseases. ACDP's international team worked closely with NAQIA and DFAT to secure the new 3-year, $4 million LabCap PNG project, which was launched in April 2022. The project is funded by DFAT and CSIRO.

Supporting NAQIA to develop this capacity will assist in control and preparedness for African swine fever in addition to other priority emergency animal diseases identified by NAQIA including highly pathogenic avian influenza, foot and mouth disease and lumpy skin disease.

By supporting PNG to strengthen their disease surveillance, diagnosis and control, we can help to improve food security and market opportunities for PNG, Australia and the entire Asia-Pacific region.

In a One Health approach that recognises the health of people, animals and the environment are interconnected.

Pigs can often be a mainstay of people's livelihoods in Papua New Guinea.

Australia Telescope National Facility (ATNF)

The telescopes of our ATNF – the Parkes radio telescope, Murriyang, the Australia Telescope Compact Array (ATCA) and the Australian Square Kilometre Array Pathfinder (ASKAP) – operated throughout the pandemic without disruption in service to the astronomers around the world who use our telescopes and improve our understanding of the Universe.

We received 263 proposals to use Parkes and ATCA and the combination of these and other telescopes that form the Long Baseline Array, and 9 large research teams spent the year running extensive pilot sky surveys on ASKAP. Science output included 136 papers published in refereed journals using data from our telescopes, such as ASKAP's first survey of the Galactic Plane – the band of stars, dust and gas across the southern sky, a region traditionally very difficult to study.

The Parkes radio telescope, Murriyang, celebrated its 60th birthday in October. Parkes' collection of pulsar timing data gathered over many decades was used to detect 7 effects predicted by Einstein's theory of general relativity, 3 of which hadn't been tested before. We are keeping Parkes at the cutting-edge, and supporting our spin-out company, Quasar Satellite Technology, with development of a cryogenically cooled phased array feed (CryoPAF) receiver. The CryoPAF is the next generation of ASKAP's multi-award-winning receiver technology and promises performance up to 30 times better than existing instrumentation. Behind the CryoPAFs for Parkes and Quasar, as well as a massive digital upgrade of ATCA, is our Jimble digital signal processing platform. Jimble uses state-of-the-art Radio Frequency System on a Chip devices that offer increased functionality and flexibility and, being the technology behind advanced digital systems in many industries, is future proofing our instrumentation pipeline.

We also operate the European Space Agency's tracking station at New Norcia near Perth, and the National Aeronautics and Space Administration's (NASA) Canberra Deep Space Communication Complex (CDSCC). In addition, we manage Australian astronomers' access to the CDSCC antennas.

Square Kilometre Array

The international Square Kilometre Array (SKA) project will see one of the world's largest and most advanced radio telescopes built on our Murchison Radio-astronomy Observatory (MRO) in Western Australia. We operate the MRO on behalf of the nation for all telescopes at the site, including our own ASKAP telescope, and we acknowledge the Wajarri Yamatji as the traditional owners of the observatory site. This year, we executed 4 contracts for construction of different elements of the SKA, including for the critical correlator and beamformer, which combines the signals from the entire telescope.

Space facilities

In July, we began operating the NovaSAR-1 Earth observation satellite as a national facility. We purchased a 10 per cent share in this innovative new instrument and now Australian researchers can apply to task the satellite in the same way astronomers apply for the ATNF telescopes. More than 250 people around the world, from the research sector and industry, are already registered to access NovaSAR-1 data. See page 33 for more information.

Another new space facility in our national suite is the In-situ Resource Utilisation (ISRU) facility, which provides a Moon-like environment for testing equipment destined for the lunar surface. Read more about ISRU on page 63. We continue to provide technical advice to the Australian Space Agency on the development of the Australian civil space sector and are working with the Agency on the National Space Mission for Earth Observation (NSMEO) program, which will see Australia design, build and operate 4 Earth observation satellites. Read more about NSMEO on page 33.

Marine National Facility

The Marine National Facility (MNF) provides Australian researchers and international collaborators with world-class research capabilities and training infrastructure throughout Australia's largely unexplored marine estate and adjoining waters. The MNF supports impactful research on issues of national significance that enables government, industry and other stakeholders to make evidence-based decisions to enhance the long-term viability and prosperity of the marine environment, industries and communities.

Eight voyages were completed aboard RV *Investigator* and through charter of New Zealand's RV *Tangaroa*.

MNF enabled collaborative research that:

- recovered 27 ocean bottom seismometers deployed near Macquarie Island in 2020 by RV *Investigator* to inform assessments of earthquake and tsunami potential, which benefit at-risk communities along Pacific and Indian Ocean coastlines
- assessed eruption style and depositional processes of volcanoes along northeast New Zealand's submarine Kermadec volcanic arc. This research provided data on hazards linked to submarine volcanic eruptions (such as tsunamis and breakage of submarine communication cables). Data collected also informed an International Ocean Discovery Program scientific deep-sea drilling site and improves exploration strategies in ancient volcanic terrains
- maintained the Southern Ocean Time Series long-term deep-water automated moorings, which gathers information for the Integrated Marine Observing System for climate, carbon and ocean health
- investigated submarine landslide debris trails across the South-Eastern Australian Continental Margin, improving our ability to evaluate the risk of submarine-landslide-generated tsunami.

RV *Investigator's* capabilities were enhanced with improved fixed seismic infrastructure and installation of the Heavy Ocean Towing System allowing fully instrumented deployments of heavy towed equipment on fibre optic cable down to 6,500 metres and providing more advanced deep-water research capabilities. Deep sea coring capability was also installed, to enable sediment cores up to 24 metres long from 6,000 metres below the ocean surface. The system is similar to that on the Australian Antarctic Division vessel RV *Nuyina* and will enable inter-operability of parts between the 2 vessels.

Pawsey Supercomputing Research Centre

The Pawsey Supercomputing Research Centre (Pawsey) is one of 2 national high-performance computing (HPC) and data facilities in Australia. It is an unincorporated joint venture with 4 Western Australian universities: Curtin University, Edith Cowan University, Murdoch University and the University of Western Australia. We own, manage and operate the facility on behalf of the partners, and it is available to all Australian researchers through a peer review mechanism.

Pawsey provides world-class infrastructure and expertise in supercomputing, data and visualisation services which enables Australia's researchers to solve large-scale data problems and obtain critical knowledge into the challenges facing our nation, to deliver globally important research.

By using Pawsey, researchers explore new materials for green energy production; utilise artificial intelligence to better treat vulnerable patients in our healthcare system; expand understanding of next-generation lithium-metal batteries to ensure safe and reliable operation; and develop epidemiological modelling supporting COVID-19 research.

As research develops, the need for computer power is growing exponentially. To ensure Pawsey remains a cutting-edge supercomputing facility, a $70 million infrastructure upgrade is continuing. Pawsey's new flagship system architecture, Setonix, is built around the same architecture used in world-leading exascale supercomputer projects, with the full system to be in production by early 2023. The new supercomputer will deliver up to 50 petaFLOPs, or 30 times more compute power than its predecessor systems, Magnus and Galaxy. To support the Australian research community in making full use of this next era of supercomputing, the Pawsey Supercomputing Centre for Extreme scale Readiness (PaCER) program was launched. PaCER is a collaboration between Pawsey and research groups across Australia that allows researchers early access to Pawsey's supercomputing tools and infrastructure, training and exclusive hackathons focused on HPC performance at scale.

The Australian Space Data Analysis Facility, hosted by Pawsey in partnership with the Western Australian Data Science Innovation Hub and Curtin Institute for Computation, with the support of the Australian and WA Governments, provided support to researchers and small- to medium-sized enterprises with space and Earth-observation data analytics and expertise to accelerate the commercialisation of new products and services.

Pawsey continued its work with an Australian quantum computing start-up from the Australian National University to develop Australia's first quantum supercomputing innovation hub. In addition, Pawsey is supporting a Quantum Pioneer Program to make a quantum emulator available to industry leaders and researchers, as well as a quantum education and research program to enable students access to one of Australia's first educational quantum computers.

National Research Collections Australia and the Atlas of Living Australia

Home to 15 million specimens, National Research Collections Australia (NRCA) discover and characterise Australia's unique biodiversity for the benefit of our community, industry and environment in a changing world. Our 6 national biological collections include specimens, tissue samples, sound recordings, images, DNA sequences and environmental data of insects, plants, fish, wildlife, algae and tree seeds.

Design of our new state-of-the-art Canberra Collections Precinct is complete, and work on construction and preparations for moving our specimens has commenced. The new precinct, slated to open in 2024, will protect and enhance the physical specimens and serve as a national focus for taxonomic and applied collections-based research. Its new genomics and digitisation laboratories will support delivery of collections-based science to an expanding range of users and outcome domains such as biosecurity, environmental monitoring, and health care. Growth of our digital assets from the biological collections has accelerated, with the ongoing automated imaging of the Australian National Herbarium. Increasing access to digital data is enabling the development of Machine Learning/Artificial Intelligence based tools for biosecurity applications (now being trialled by DAWE field staff) and applications to identify algae that cause harmful blooms, for use by the aquaculture and fishery industries.

Our fundamental biodiversity discovery work aimed at understanding Australia's unique biodiversity continued with the publication of major taxonomic works for several key groups including nematodes and moths. We also determined the extent of Indigenous plant knowledge recorded in the Australasian Virtual Herbarium.

The Environomics Future Science Platform (FSP) explores genomics for natural resource management. The FSP's National Biodiversity DNA Library is a new initiative with partners across sectors that realises the potential of environmental monitoring using DNA, by providing a comprehensive database of reference genomes for all Australian plant and animal species based on identified specimens in our national biological collections. To help conserve endangered fish species and manage commercial fisheries, the FSP has also developed a cost-effective non-lethal DNA test that can determine the age of any fish.

The Atlas of Living Australia (ALA) is Australia's most comprehensive source of standardised online biodiversity data. It allows open access to Australian bio-collections, including the digital data in our research collections (NRCA) as well as from contributors in other institutions, and it provides a critical tool for biodiversity scientists, policy makers, land managers, educators, and students.

The ALA is also the Australian node of the Global Biodiversity Information Facility. This year we delivered more than 100 million biodiversity occurrence records to over 125,000 globally registered users to support innovative science across the planet.

In addition, in 2021–22 we provided data for the 2021 State of the Environment Report, and the data and biosecurity alert capability for Australia's Chief Environmental Biosecurity Office and Chief Plant Protection Office. We launched the Australian Biodiversity Data Mobilisation Program, providing grants to institutions and research groups to accelerate the digitisation of Australian biodiversity data. New capability enabled innovative genomic data applications in biodiversity, agricultural and environmental research applications, and we continued to support Indigenous Ecological Knowledge programs with the release of the *Noongar Boodjar plant and animal encyclopaedia*. Read about these programs on pages 23 and 195.

New facility recreates the Moon in a room

Future planned missions to the Moon will explore the lunar surface to identify materials to use in support of scientific exploration and sustaining a long-term human presence there. Lunar exploration brings unique challenges, observed first-hand by Apollo program astronauts working on the Moon's surface. One of those challenges was the fine abrasive moondust that covered their spacesuits and instruments.

In December, we opened the In-situ Resource Utilisation (ISRU) facility, our lunar testbed in Brisbane. The purpose-built facility provides a Moon-like environment for testing and evaluating rovers and related equipment, with an initial focus on exploring lunar terrain and resources.

The lunar regolith is both the solution and one of the major challenges facing these robotic missions. The regolith contains useful materials like oxygen that could be used for fuel or breathable air. However, these elements first need to be identified, and extraction and processing methods developed.

Additionally, the powdery, sharp and electrostatically charged Moon dust poses a major challenge – it sticks to everything and has the potential to damage the technology sent to investigate it. Our facility offers technology developers the opportunity to test their equipment closer to home, in a safe environment, to find solutions to this dusty problem.

CSIRO is involved in research in the areas of space activity that line up with the national civil space priorities outlined by the Australian Space Agency.

Our lunar testbed simulates some of the physical characteristics of the lunar surface for realistic testing and evaluation of lunar landers and related technology.

The ISRU facility includes a sealed dust area to safely handle and manage various types of lunar regolith simulant – fabricated Moon dust – with similar properties to the surface of the Moon. It also incorporates smaller tanks and pits for smaller-scale tests and a mission control room to remotely monitor rovers, payloads and related equipment. Another advantage is the ability to integrate with other facilities and equipment at our Queensland Centre for Advanced Technologies, including the robotics playground where our robotics team trained for their silver-medal performance in the recent DARPA Subterranean Challenge.

The facility will complement our space research and the activities of the Australian space sector. Our ability to simulate the lunar terrain at this scale is an exciting advancement for the development of space technology in Australia.

Analysis of performance

Our efforts this year contributed to us delivering towards our outcome (see Table 3.3).

World-class facilities and collections are available to be accessed and used effectively by the research community and public.

Table 3.3: Summary of our performance for managing national research infrastructure

FOCUS AREA	METRIC[1]	TARGET	RESULT
World class facilities and collections are made available for access by the research community and used effectively	ACDP: Compliance with Australian legislation and regulations and International Organization for Standardization accreditations	Maintain or exceed compliance	**Achieved**: Up to date and compliant with all current audits[2]
	ATNF: successful astronomical observation[3]	Minimum of 70% successful astronomical observations	**Not achieved**: 68%
	ATNF: time lost during astronomical observations and operation[3]	Maximum 5% time lost during scheduled astronomical observations	**Achieved**: 1.8%
	Pawsey: supercomputer core-hour use[4]	90% core hours on supercomputer facility	**Achieved**: 94.4% utilisation
	NRCA: outward loans of collection[5]	70% outward loans of collections (averaged over 5 years)	**Achieved**: 70%
	MNF: successful marine research days delivered[6]	Minimum of 90% successful research days delivered on Marine National Facilities, subject to any COVID-19 restrictions	**Not achieved**: 80%

1. Source: 2021–22 Portfolio Budget Statement (PBS).
2. ACDP successfully complied with PC2, PC3 and PC4 requirements of the Department of Health and the OGTR requirements of the Department of Agriculture. ACDP achieved recertification to ISO 14001, ISO 9001, ISO 17025 and ISO 17043 during the 2021 operational year.
3. ATNF data is for April–September 2021, and October 2021 – March 2022 observing semesters for Parkes and ATCA.
4. Supercomputer core-hour use represents the percentage of core hours available on the Pawsey Cray XC-40 supercomputer Magnus that are used by research projects awarded an allocation on Magnus during 2021–22.
5. NRCA outward loans target recognises that preparing loans requires significant time investment and some requests may not be possible to comply with international conventions and legislation.
6. MNF research days recognises the percentage of the planned schedule that was successfully delivered, meeting the stated voyage objectives. In 2021–22, 56 sea days were cancelled to comply with COVID-19 measures, bringing the total possible days at sea to 244 instead of 300.

Consolidated analysis of performance

Australian Centre for Disease Preparedness

ACDP repeatedly demonstrated its vital role in Australia's biosecurity infrastructure. Together with our partners, our people worked tirelessly to protect Australia's livestock and aquaculture industries and the community from exotic and emerging infectious diseases, particularly COVID-19. ACDP continues to maintain or exceed the regulatory requirements certified by the Department of Agriculture, Water and the Environment, the Office of the Gene Technology Regulator, the Department of Health's Security Sensitive Biological Agents legislation and all relevant International Organization for Standardization accreditation. This is critical to enable ACDP to provide the nation's frontline, high-containment facility for research into highly infectious agents in the world, biosecurity, and protecting Australia's multi-billion-dollar livestock and aquaculture industries.

Australia Telescope National Facility

The Parkes radio telescope, Murriyang, achieved similar results to previous years, but observing time was temporarily down for the Australia Telescope Compact Array due to a change in observing programs from long-term surveys to rapid responsiveness, which brings higher scientific return but low predictability, and scheduling inefficiencies driven by the telescopes ageing correlator, which is in the process of being replaced. Our newest radio telescope, ASKAP, achieved its KPI of 50 per cent of time being used for successful astronomy observations. This enabled high-impact science to continue with astronomers around the world, improving our knowledge of the Universe by investigating the formation and evolution of galaxies, magnetic fields, black holes and pulsars.

Pawsey Supercomputing Centre

The Pawsey Supercomputing Centre maintained its track record of exceeding its utilisation target with 94.4 per cent of available central processing unit time used this year. This level of utilisation enables our researchers to successfully deliver their research for the betterment of the nation.

National Research Collections Australia and the Atlas of Living Australia

The National Research Collections Australia achieved the target for outward loans of collections. The loans enable scientists affiliated with research institutions to access our specimens without travelling to our sites. Specimens lent to other national and international institutions support research into Australia's unique biodiversity and contribute to national and international biodiversity conservation. However, as we move to digitisation of the Collections, we expect to see physical loans reduce as the information is accessed online.

Marine National Facility

In 2021–22, RV *Investigator* delivered 195 sea days, a significant achievement given the ongoing impacts to research vessels around the world due to measures related to the COVID-19 pandemic. Our seagoing operations were also impacted by activities related to addressing pressure vessel compliance.

Equipment commissioned and upgraded provided improved seismic research infrastructure, heavy towing systems and deep-sea capabilities for our researchers and their international collaborators. Research conducted provided key information to government, industry and other stakeholders to support decision-making for monitoring and risk management of submarine earthquakes and tsunamis, regional and global climate monitoring, and scientific deep-sea drilling.

Objective 3

Stimulate innovation for Australian industry, academia and government

Outcome

Increase the rate of research translation in the innovation system programs and through investments that create new ventures and other outcomes to deliver impact for the nation.

We deliver on this objective by developing strategic R&D partnerships and STEM capability and by delivering excellent customer experiences. The diagram depicts our key collaborative partners, including government, academia, the community and Australian industry, including Small and Medium Enterprises (SMEs).

Innovation through collaboration

We can only continue delivering on our purpose if we collaborate and cooperate with our partners. That's why we work with Australian and international universities, governments and industries, and with businesses of all sizes.

We partner with research institutions through co-location, co-publication and collaborative research to boost innovation and ensure the best available research is used to solve the greatest challenges and deliver outcomes for Australia and the world.

We share our research activities, listen to the needs of ministers and government departments, and provide scientific information and advice to inform policy development and program implementation.

We deliver learning experiences for students, teachers and the community to equip Australians with the knowledge they need to enter the workforce and increase their science, technology, engineering and mathematics skills.

We bring together our partners in industry to co-create commercialisation outcomes that deliver the greatest impact and create economic value for the nation.

Building strong, collaborative relationships

Relationships with government: local, state, federal and international

Advice to government

We provide advice to governments to assist in evidence-based policy development through briefings on our research, reports related to priority areas, submissions to formal consultation processes and parliamentary inquiries.

This year, we delivered roadmaps that provide national insights for growth areas underpinned by science and informed by developments in technology including:

- *'Protein: A Roadmap for unlocking technology-led growth opportunities for Australia'*, outlining a $13 billion market opportunity to create 10,000 jobs in value-added traditional, plant, and novel protein products to feed the world's growing population.
- The *CO2 Utilisation Roadmap,* highlighting how emerging carbon capture and utilisation technologies could leverage Australia's advantages to grow industries, create zero or low carbon products, and position Australia for the export of low emissions chemicals and fuels.

We contributed to the World Economic Forum's *Insight* report into quantum computing which was published in January and presented best-practice governance principles to guide ethical and equitable future design and adoption through regulation.

State and territory governments are key partners. For example, we delivered 2 projects this year with the Northern Territory (NT) Government, this included:

- the *'Feeling Cooler in Darwin: Darwin Heat Mitigation and Adaptation Strategy'* with partners including the Australian Government and the City of Darwin. This built on research from our Darwin Living Lab
- a co-developed plan to support rapid emissions reduction across the energy sector in Northern Australia through a large-scale low emissions Carbon Capture Utilisation and Storage Hub outside of Darwin. This included industry and engineering partners.

Assist government in decision making

We assist government decision making by developing new tools, like those using models and data analytics, that inform policy making and support implementation.

Following the devastating 2019 Black Summer bushfires, our Atlas of Living Australia is coordinating 3 projects under the Australian Government's $200 million Bushfire Recovery Program. Our partners include Western Sydney University and the University of New South Wales. These projects engage experienced citizen scientists to document how Australia's unique plants, animals and fungi recover from fire, building a collection that can be used by taxonomists, ecologists, and researchers. Other partners include the NSW Rural Fire Service and with them we released the Vesta Mark 2 model, Australia's most advanced model for predicting the speed and behaviour of eucalypt forest fires, to assist with planning to save lives and property during bushfires. Read more about our bushfires work on pages 29 and 122.

Responding to record-breaking floods in recent months, the Australian Government has invested in a Supply Chain Benchmarking Dashboard, which uses our Transport Network Strategic Investment Tool (TraNSIT) to model the impact on supply chains from natural disasters, such as recent Queensland floods. TraNSIT provides detailed and interactive modelling of Australian transport and logistics supply chains, from point of production through to the market or export port.

Delivering government programs

Building on the advice and assistance we provide to governments, we use our specialist expertise and connections to run programs on their behalf.

Our track-record in commercialisation has been recognised and we have planned for the expansion of our following programs:

- ON accelerator to fast-track ideas into start-ups (read more on page 71)
- the Innovation Fund managed by Main Sequence to invest in science-driven start-ups (read more on page 74)
- the Industry PhD program to support science PhD candidates working in industry (read more on pages 76 and 79).

We provide the university sector and others access to our facilities and laboratories that we run for the nation. We are hosting the Australian Government's National Artificial Intelligence (AI) Centre and managing its Next Generation AI and Emerging Technologies Graduates' programs, both part of the AI Action Plan. The Centre is intended to drive businesses adoption of AI technologies by creating trusted paths to responsible and inclusive AI adoption from research. The Graduates' program has awarded its first round of scholarships supported by industry partners.

Our research supports the reinvention and creation of new industries through Australian Government programs in space and resources. We will deliver new Earth observation satellites, as well as satellite calibration and validation infrastructure, as part of the government's National Space Mission for Earth Observation (NSMEO) led by the Australian Space Agency, with Geoscience Australia, the Bureau of Meteorology and the Department of Defence.

We are hosting the virtual National Critical Minerals Research and Development Centre, in partnership with Geoscience Australia and the Australian Nuclear Science and Technology Organisation, to strengthen Australia's critical minerals capability and resource pipeline.

Our global relationships support Australian Government initiatives in the region, including our partnership with India that includes the India-Australia:

- Innovation and Technology Challenge
- Critical Minerals Research Partnership
- Green Steel Partnership.

Many of these partnerships aim to create COVID-19 economic recovery opportunities. We have committed to work with Indonesia's Ministry of Research and Technology (Kemenristek) and Australia's Department of Foreign Affairs and Trade on a Plastics Innovation Hub in Indonesia to bring together researchers, investors, businesses, and community and government leaders to tackle plastic pollution in the Indo-Pacific.

Relationships with industry: large corporations, small- to medium-sized enterprises, accelerator and innovation funds, start-ups, and venture capitals

We work with organisations large and small to solve problems, develop new, cutting-edge technologies, and use breakthrough science to create real-world solutions.

This year, we have established several new industry partnerships which, under new engagement models, are designed to accelerate growth for our customers. Our industry engagement models include portfolio research and development (R&D), capability partnerships, collaborative innovation programs and advisory services.

Collaboration with business and industry

Large corporations

Collaboration enables us to create opportunities to shape Australia's future global advantages. Our Strategic Partnerships Program is focused on building greater resilience, connectivity, and impact through cross-organisational strategic customer relationships.

Businesses work with us to improve competitiveness, reduce risk, expand markets, and develop new industries based on our research. Our partnerships enable us to encourage the uptake of our world-class scientific research.

We continued to adopt a range of commercialisation pathways to take our research to market, including licensing our intellectual property, providing research in exchange for equity, embarking on joint ventures and establishing spin-outs.

We worked closely with customers as they responded to the evolving operating environment, affected by COVID-19, and implemented a range of customer-focused initiatives.

New strategic partnerships include:

- **Global partnerships to drive local innovation**: CSIRO and Google announced a strategic relationship focused on Artificial Intelligence (AI) and pursuing collaborative projects in areas of national opportunity. A key outcome of the partnership has been Google's foundational membership in the National AI Centre as well as partnering with us to protect the Great Barrier Reef with AI.
- **A public-private sector initiative with the Commonwealth Bank of Australia** to develop solutions for the financial sector to manage the physical and transitional risks posed by climate change.
- **Bilateral science and technology relationships with the United States (US)**: We signed an MoU with the National Science Foundation (NSF) to accelerate joint research, and initiatives in areas of mutual priority between Australia and the US.
- **Tackling plastic waste and creating a circular economy** through the establishment of the Indo-Pacific Plastics Innovation Network. The Indonesian and Vietnamese nodes have been launched, with Mekong to launch in 2022–23.

Relationships like these provide a platform for us to support local innovation, foster new technology development and the creation and adoption of new market opportunities for Australian businesses. We are evolving the way we partner to respond in a strategic way to global challenges and to create bold new opportunities. This includes our Missions program, which centres on large-scale, impact-focused scientific and collaborative research initiatives aimed at making significant breakthroughs. Read more about this on pages 38–39.

Small- to medium-sized enterprises (SMEs)

SME Connect supports collaboration between industry and publicly funded research institutions by bringing SMEs together with Australia's best researchers and facilities. We work with SMEs across Australia to support and enable innovation through funding, expertise and resources.

This year, we facilitated 351 research projects nationally for 319 companies, which injected more than $33 million into the R&D of these projects. Of these projects, 288 were delivered by 41 Australian research organisations, including 35 universities and CSIRO, and 63 were grants for recent graduates to work on in-house research projects for SMEs.

We delivered 5 programs this year:

- Innovation Connections, funded by the Australian Government as part of the DISER Entrepreneurs' Programme.
- CSIRO Kick Start, a strategically funded activity.
- Innovate to Grow, an online experiential learning program funded by CSIRO and external supporters.
- SIEF Ross Metcalf STEM+ Business Fellowship program, funded by SIEF (read more on page 71 and in Part 6).
- Generation STEM Links, a new NSW Government funded initiative to place undergraduate and TAFE students into businesses for work placements. Read more about this on page 71.

We also deliver the SME Collaboration initiative – a CSIRO SME Strategy to become an exemplar in engaging with SMEs, and lead ecosystem change to double the number of SMEs that engage with publicly-funded R&D in Australia. This work involves (i) connecting and expanding existing SME facilitation programs, (ii) simplifying engagement by removing barriers; and (iii) providing SME training and researcher placements to improve the awareness of collaborative opportunities.

Innovation Connections

Innovation Connections is a free service for established SMEs to understand their research needs and facilitate connections with the research sector. It also provides dollar-matched funding for R&D projects with universities and research organisations across Australia, and our dedicated team of facilitators help business find the right expertise for them regardless of SME or researcher location. We were appointed the National Delivery Partner for Innovation Connections in 2020 and we receive Australian Government funding to employ 19 facilitators in Perth, Adelaide, Melbourne, Canberra, Wollongong, Sydney, Newcastle, Gold Coast, Brisbane and Townsville.

In 2021–22, we facilitated 302 Innovation Connections projects for 270 Australian SMEs. These projects included 239 R&D projects delivered by 35 Australian universities, CSIRO and 5 other research organisations, and 63 graduate placements in which recent graduates are employed by SMEs to work on in-house R&D projects. The total grant value for the 302 projects was just over $29 million with just over half of this contributed by the companies involved.

CSIRO Kick-Start

CSIRO Kick-Start supports Australian start-ups and small businesses to locate the best capability in CSIRO for their business and access affordable, high-quality expertise through subsidised research to maximise impact and output. It facilitates collaboration between businesses and our research staff. This enables participating firms to create new or expanded products or services and leads to capital raising or entry into international markets. Since 2017, the program has helped over 185 companies across 217 projects, worth almost $20 million. Thirty-six Kick-Start alumni companies have gone on to do 90 further projects and agreements with CSIRO worth over $10.5 million. This year, 49 new Kick-Start projects commenced with a total research value of just over $4 million.

Innovate to Grow

Innovate to Grow is a 10-week experiential learning program to help SMEs understand the benefits of R&D, work on a real business challenge, connect with relevant experts and link to relevant funding programs. The program is run in collaboration with an education technology partner and our researchers. Innovate to Grow is delivered using Pactera's online ed-tech platform and facilitation services with assistance from CSIRO and university researchers, industry groups and federal and state government supporters.

Since launch in June 2020, over 250 SMEs have taken part in 10 cohorts including Agrifood, Mining, Equipment, Technology and Services (supported by the Mineral Research Institute of Western Australia) and Plastic Waste. This year, the program expanded into the Cybersecurity, Space, and Defence sectors, with assistance from the DISER Cybersecurity Skills Partnership Innovation Fund grant, the Australian Space Agency and Investment NSW. Feedback on the program and impact measures have been outstanding, with an average 8.5 (out of 10) willingness-to-recommend score and up to 20 per cent of SMEs initiating research collaboration initiatives in the first year post-program.

SIEF Ross Metcalf STEM+ Business Fellowship

The SIEF Ross Metcalf STEM+ Business Fellowship program supports 2–3 year research projects being delivered by early career researchers to innovative Australian businesses. Since commencing in 2016, STEM+ Business has supported 44 projects and a further 3 projects commenced this year. Funding is now fully allocated, and 32 projects have reached completion.

Generation STEM Links

Generation STEM Links is a new program for 2022 delivered by SME Connect on behalf of CSIRO Education and Outreach and made possible by a $25 million endowment from the NSW Government to the Science and Industry Endowment Fund. The program places undergraduate and TAFE students into paid industry placements in priority locations across NSW. We provide facilitation and student-matching service as well as distribute dollar-matched grants for businesses. This early-stage program has been well-received by students and businesses and will target up to 300 placements over the next 2 years.

Accelerator and innovation funds, Start-ups, and Venture capitals

Innovation programs for researchers

Throughout 2021–22, we continued to deliver innovation programs that give research teams the skills and confidence they need to translate their solutions into positive impact.

We delivered ON Prime programs aligned to missions (Critical Energy Metals, Towards Net Zero Emissions, Future Protein and Drought Resilience), bringing together technologies from across Australia's research sector to undertake customer discovery for their technologies.

We delivered a D.Start program in partnership with Defence Science and Technology Group. Supported by the Next Generation Technologies Fund, D.Start supports emerging and future technologies with the potential to provide game-changing capabilities for Australia's defence industry. We also supported current and past D.Start participants to meet key players in the defence ecosystem and connect with exhibitors as part of INDO PACIFIC in Sydney.

We supported our researchers to clarify the focus of their research through our Market and Community Discovery and At Scale Opportunity Sprint programs. We helped researchers to develop industry engagement skills in 3 ON Prime Lite programs with the university sector.

Since 2015, we've supported more than 1,000 teams and 3,200 participants who have gone on to receive $115 million in commercialisation grants and create 66 new ventures that have raised $114 million in capital and are employing 500 people.

Members of our D.Start alumni met key players in the defence ecosystem as part of INDO PACIFIC event held in Sydney in early May.

Manufacturing

We have been working with Government to support the Modern Manufacturing Initiative. The initiative aims to stimulate business investment in the manufacturing sector by addressing barriers to scale and competitiveness for Australian manufacturers. It aims to build manufacturing capabilities and networks, lift productivity, create jobs, build global competitiveness and boost the export potential of Australian manufacturers.

Several SME Connect program alumni were funded by the Australian Government's Modern Manufacturing Initiative funding.

With the SME Connect facilitated support, training and some matched funding, these companies were able to drive their business growth, despite the pandemic. Grant recipients included:

- Gilmour Space Technologies who are a strong example of why you don't need to be a big player to make big impact, especially in the world of space technology. Accessing Innovation Connections Facilitators for advice and assistance with government opportunities saw them receive an Innovation Connections Graduate Placement and Researcher Placement grants to grasp expertise capabilities. They've continued to grow the company size on the Gold Coast, shaping into one of Australia's leading space companies.
- Arafura Resources Limited worked with minerals researchers Keith Barnard and Jian Li on an early minerals project via CSIRO KickStart. Since then, their capability fast tracked, leading to the MMI funding for construction of an $90.8 million rare earth separation plant at its Nolans Project. The work the new plant can deliver is significant to furthering Australia's critical minerals supply.
- Australian Plant Proteins (APP) optimised the protein content extracted from faba beans to more than 80 per cent, through a CSIRO Kick-Start project. Now APP owns Australia's only commercial scale pulse protein extraction facility.
- Australian Vanadium Limited is an emerging vanadium producer developing its high-grade Australian Vanadium Project in Western Australia with support from Innovation Connections. Vanadium is valued in the manufacturing industry due to its malleable, ductile and corrosion-resistant qualities.

Manufacturers all over the nation have been able to innovate and grow their business due to support from CSIRO SME Connect.

Pandemic pivot: SMEs drive Australian recovery

With small- to medium-enterprises making up 97 per cent of all Australian businesses it was critical that we worked hand in hand with industry when COVID-19 reached our shores.

We showcase this year two Australian companies, who in collaboration with our SME team, successfully pivoted not just for resilience and recovery, but also growth.

At the start of the pandemic, the Wash Wild founder saw consumer demand for effective cleaning products without harsh chemicals soar. Working with our researchers, through CSIRO Kick-Start program, Wash Wild developed a natural and uniquely Aussie formula, using a range of native oils such as Tasmanian pepper and lemon tea tree.

Through testing against bacteria including *Escherichia coli*, *Acinetobacter baumannii*, *Staphylococcus aureus* and *Saccharomyces cerevisiae*, the novel oil blend was found to be 99.9 per cent effective on germs while still being gentle on the skin which is critical with increased hand washing.

The founder states that our expertise was invaluable to the process, with the range launched into a major supermarket in early 2022.

Wash Wild has now trademarked the name 'W4CR', which is the unique proprietary oil blend, and is planning on sending the unique blend to offshore markets for use in affordable, natural products.

Servicing the hospitality industry, the 60-year-old Norris Industries was on the brink of collapse when COVID-19 pandemic hit. With Australia impacted by global supply chain issues, Norris Industries saw an opportunity to launch locally produced sanitisers.

Having previously engaged with Innovation Connections through our Innovation Facilitator, Norris Industries once again turned to our SME Connect team for support. Through the University of Newcastle's COVID-19 virus testing laboratory, they conducted validation testing on the sanitisers for the efficacy data required to go to market. Within months, Norris Industries had an onshore manufactured product in the hands of consumers. They extended the line to include cleaning products sold both here and overseas.

These are 2 examples of Australian businesses using R&D and our expertise to pivot in challenging times. Whether driven by pure survival or being in the right place, at the right time, we were pleased to help make the connection between industry and research expertise.

One of our strategic goals is to work with industry to double the number of SMEs engaging with publicly funded R&D by 2030, through the new SME Collaboration Initiative.

SME Connect facilitated hundreds of new projects with industry leaders such as Wash Wild, helping them grow, even during the pandemic.

CSIRO Innovation Fund managed by Main Sequence

Main Sequence, the deep technology venture fund founded by CSIRO invests in translating publicly funded Australian research into extraordinary global companies that create jobs and grow our economy. Between 2017 and 2021, a $100 million investment by CSIRO and government stimulated over $400 million in private sector venture investment in the sector.

In 2021–22, Government announced $150 million of support for Main Sequence to launch fundraising for its Fund 3 and continue its mission to solve the world's biggest problems in health, food, space, decarbonisation and industrial productivity. They do this through turning science and research into breakthrough companies, emerging from the Australian university sector, like Samsara, MGA Therma and Q-CTRLl. Read more about our work with universities on page 75 or Table 3.4 (on page 76).

Main Sequence pioneered a venture science model approach that starts by identifying a big challenge then brings together science, industry, founders and investment to solve the challenge through company creation.

Since 2017, the Fund has helped to build 42 deep technology companies, which have created over 1,200 technology jobs. Every dollar invested by Main Sequence has attracted over $3.50 in co-investment from other venture funds, strategic investors and angel investors.

Innovation Fund case study: Endua

Endua start-up was launched in May 2021 as a collaboration between Main Sequence, CSIRO, and Ampol and is built on an impact-focused company creation model. The initiative is aimed at the development, delivery, and adoption of hydrogen-powered energy storage solutions at scale to generate electricity on demand for off-the-power-grid consumers. Hydrogen, if made from renewables, is emission-free and allows for a large amount of energy to be stored for continuous use, during the periods when renewable source is not available.

As the technical arm of this collaboration, CSIRO is capitalising on over 15 years of experience in building Polymer Electrolyte Membrane electrolyser technology, the foundational technology to produce hydrogen. The initiative addresses 3 key CSIRO challenges – resilient and valuable environments, sustainable energy and resources and future industries.

The new hydrogen storage technology is envisioned to deliver triple bottom line impacts through producing economical, environmentally friendly, and societally feasible renewable energy solutions for the prosperity of Australia. The successful development and adoption of the proposed systems will address energy security and decarbonisation, boost renewables penetration, build a new industry in Australia and help realise the nation's vision to be 100 per cent renewable energy powered while addressing the growing commercial and domestic power demand in off-grid areas.

Relationships with research: universities, Publicly Funded Research Agencies (PFRAs), Cooperative Research Centres (CRCs) and Research Development Corporations (RDCs)

We're leveraging our experience in delivering programs that support a culture of innovation and entrepreneurship to help drive a greater impact across Australia's publicly funded research system.

The development of the Australian Government's University Research Commercialisation Action Plan this year, focused on boosting collaboration between universities and industry to drive commercial return and we supported this process. The Plan included $150 million in support for future CSIRO Innovation Funds as part of Australia's Economic Accelerator.

> The new hydrogen storage technology is envisioned to deliver triple bottom line impacts producing economical, cleaner, renewable energy solutions for the ongoing prosperity of Australia.

Our input was provided to universities during the business case development process for the Australian Government's proposed commercialisation program. Universities are able to access our specialist equipment which can drive the technology readiness level of research for this work.

A scale up of the industry PhD and the ON Program is expected to provide industry-leading innovation training and support to teams from Australian universities and research institutes from July 2022.

We provide unique insights in technology development and trends and accelerator programs that contribute to the success of Australian innovation by linking it with systems and customers globally through consortia and aiding market access. Building on the Australia India-Australia Circular Economy (I-ACE) Hackathon in India, a new India-Australia Innovation and Technology Challenge will support small businesses and entrepreneurs to launch innovative technology solutions tackling environmental and economic challenges such as waste reduction, water security and food system resilience. Like the ON program, this will help fast track and scale around 20 cutting-edge Australian and Indian innovations each year. In partnership with Australian Trade and Investment Commission's Landing Pads, we've supported Australian SMEs through technology and market boot camps to access new international markets for their technologies and access capital to drive expansion.

Working with industry and corporate partners, we are breaking through global barriers to solve international challenges. Building on a 10-year relationship with Jacobs Australia we are developing an innovation program with multidisciplinary expertise from both organisations to solve challenges. Alignment across key challenges is the focus, including water, plastics, circular economy, hydrogen, space, and sustainability. This partnership is expected to deliver long-term, sustainable outcomes.

University collaboration

CSIRO collaborates with every Australian university. We are a major contributor to Australian research in key research fields, including Agriculture Sciences, Environment and Ecology, Geosciences, Plant and Animal Science, Space Sciences, Engineering, Materials Sciences and Chemistry. In these research fields and working with our university collaborators, we contribute a high share of national output and perform well in terms of academic impact.

Two-thirds of our publications involve Australian research collaborations. Table 3.4 shows 10 Australian universities with the larger extent of scientific publication output from collaboration, for the different research fields. Monash University is a key collaborator in Chemistry and Materials Science (in part reflecting co-location with our Business units that work in those fields). We have a high level of collaborations with the University of Tasmania and with the University of Queensland in the closely related fields of Geosciences and Environment and Ecology, and additionally in Plant and Animal Sciences and Agricultural Science.

We collaborate strongly with some other universities in specific areas (some of which are not listed in Table 3.4). For example, we collaborated extensively with James Cook and the Australian National University in the fields of Plant and Animal Science and Environment and Ecology. Our collaborations with Australian researchers have resulted in the highest number of joint authorship papers between 2017 and 2021, where 69 per cent of our publications over the past 5 years were co-authored.

We contribute to training and developing Australia's research workforce by co-supervising university students and Table 3.4 also shows the number of higher degree research students (mainly PhD candidates) that we have co-supervised with the top ten co-publishing universities in the 12 months to 31 May 2022.

Table 3.4: Highlighting our most active university collaborations

UNIVERSITY	NUMBER OF COLLABORATIVE PUBLICATIONS (2017–21)	AGRICULTURAL SCIENCES	CHEMISTRY	ENGINEERING	ENVIRONMENT AND ECOLOGY	GEOSCIENCES	MATERIAL SCIENCES	PLANT AND ANIMAL SCIENCES	SPACE	CO-SUPERVISED HIGHER DEGREE RESEARCH CANDIDATES
University of Queensland	1,338	116	57	36	294	69	37	283	10	100
University of Western Australia	1,176	88	24	49	235	158	18	183	169	35
University of Melbourne	1,152	98	73	56	159	102	66	110	48	49
Monash University	1,127	19	204	66	86	98	257	17	29	83
University of Tasmania	1,098	60	11	22	275	200	0	316	76	64
Australian National University	1,093	40	25	115	201	84	28	217	119	118
University of New South Wales	951	28	68	108	100	163	58	58	40	107
University of Sydney	848	51	39	81	82	23	24	85	182	31
Curtin University	758	18	26	64	50	169	12	53	231	30
University of Adelaide	647	125	19	18	114	67	22	92	15	39

Tertiary students

We collaborate with universities, industry and other stakeholders to provide postgraduate studentships, undergraduate traineeships, and vacation studentships for undergraduate students.

The student experience is important to us with an emphasis on providing an increased collaboration with industry, as well as supporting postgraduate students looking for careers outside of academia.

As part of the tertiary student programs, students work on research projects that provide learning and development opportunities, which supports the increasing demand for Australia's STEM capability.

We currently have 20 CSIRO Industry PhD (iPhD) students but anticipate an increase in this number as a result of funding allocated towards this program through the Government's University Research Commercialisation Action Plan.

In the 12 months to 31 May, we supported 1,413 undergraduate and postgraduate students through our programs, represented in Table 3.5. The number of students fluctuates within a year and across years, as students start and finish programs at different times of the year. The decrease in student numbers from 2018–19 is as a result of COVID-19 related restrictions that continue to make an impact on national and international borders, site closures and uncertainty about how restrictions may continue in the future.

We anticipate that with travel restrictions easing we should see an increase in student numbers in coming years, including international students returning to Australia.

Table 3.6 provides a breakdown of the number of students that we supervised, or both supervised and sponsored. These numbers represent a point in time as at 31 May 2022, as distinct from the total number of students over the course of the whole year.

Table 3.5: Our students over the past 5 years

TYPE OF ENGAGEMENT	2017–18	2018–19	2019–20	2020–21	2021–22
Tertiary level					
Undergraduate students	633	529	485	376*	384**
Postgraduate students	1,438	1,456	1,392	1,079	1,029
Total	**2,071**	**1,985**	**1,877**	**1,455**	**1,413**

*Includes 203 vacation students. **Includes 197 vacation students.

Table 3.6: Our supervised and sponsored students at 31 May each year

	2017–18	2018–19	2019–20	2020–21	2021–22
Sponsored and supervised postgraduates					
PhD	418	390	451	403	378
Masters	12	7	7	16	16
Subtotal	430	397	458	419	394
Supervised postgraduates (not sponsored)					
PhD	398	422	337	254	217
Masters	147	137	84	57	58
Subtotal	545	559	421	311	275
Subtotal postgraduates	**975**	**956**	**879**	**730**	**669**
Undergraduates					
Industrial trainees	100	100	56	46	39
Honours students	74	54	48	46	27
Subtotal	174	154	104	92	66
Total tertiary students	**1,149**	**1,110**	**983**	**822**	**735**

Developing early career researchers

CSIRO Early Research Career (CERC) Postdoctoral and Engineering Fellows

Our program provides a differentiated learning, development and training program to develop future leaders of the innovation system. These Fellowships enhance the research capability of PhD and Engineering master graduates so that they are better able to pursue a career in research either within CSIRO or beyond.

As an impact-driven research organisation, a background and skill set in engineering disciplines is important to us. As a result, an early career researcher pathway for engineering graduates has been established within the CERC Fellow learning, development and training program.

Figure 3.5 shows that, while CERC Fellow numbers declined in 2020 and 2021, which was attributed to uncertainty and border restrictions, the number has increased this year. This is as a result of our CERC Fellow COVID-19 support program implemented last year and an increase in our funded positions. It is anticipated that this number will continue to rise as a result of a targeted advertising campaign starting in May 2022 aimed at attracting early career research talent within Australia.

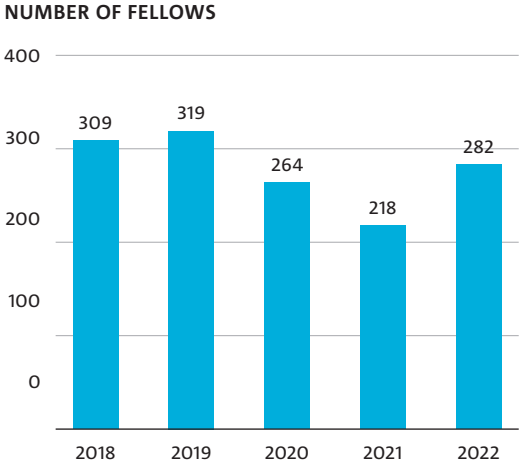


Figure 3.5 CERC fellows over past 5 financial years

This will give postgraduate students opportunities to commence a CERC Fellowship, as well as current CERC Fellows nearing the end of their program opportunities to commence independent researcher positions.

As Fellows have concluded their terms and new Fellows have been appointed during the year, a total of 382 different Fellows have been employed throughout the year.

Through our university and industry engagement Postdoctoral Fellows are also employed at universities with 36 Affiliate Postdoctoral Fellows engaged at the end of June.

Undergraduate Research Opportunities Program (UROP)

The Undergraduate Research Opportunities Program (UROP) facilitates student job placements in research laboratories in Victoria. The sponsor CSL Limited provided a keynote speaker who was a previous participant to welcome the 22 new students and 22 supervisors in February. This year's students have project placements at: CSL Limited, Hudson Institute of Medical Research, Australian Regenerative Medicine Institute, Walter and Eliza Hall Institute, Peter MacCallum Cancer Centre, Monash University, and Monash Biomedical Discovery Institute. Round 2 attracted 413 student applications for places in the second half of 2022.

The program was evaluated and participants from the program between 2004 and 2021 were surveyed. Forty per cent responded and 7 case-study interviews were also conducted. Findings indicate a positive perception of UROP, with 98 per cent of respondents saying they would recommend the program to undergraduate tertiary students. Other findings included respondents reporting that UROP had:

- a significant impact on their education and/or career decisions (82 per cent)
- motivated them to pursue a career in STEM (60 per cent)
- led to them now studying or they had completed a post-graduate qualification (81 per cent)
- started working in a job directly related to their placement research (35 per cent).

Creating value from deepening R&D collaborations

Delivering innovation impact and solving big challenges cannot be done in isolation. Working effectively with our university, industry and end user colleagues enables us to co-create ideas and research solutions that make a difference socially, environmentally and economically. We create value through iteratively enhancing our existing R&D collaborations with our stakeholders and through exploring new ways of working more effectively together, so our future collaborative outputs enable our stakeholders to deliver greater impact.

Building industry-focused research capability

We play an important role in assisting universities with training the next generation of Australian researchers, through co-supervising Higher Degree Research (HDR) students. Since 2018, we have explored, in collaboration with several universities, how to deliver an enhanced HDR student experience through an industry-focused PhD (the iPhD program). The pilot program brings together a supervisor from each of CSIRO, academia, and an industry partner to develop a project together and co-supervise the iPhD student. During the 4-year program, the student also receives additional professional development training and undertakes a 6-month placement with the industry partner to gain experience working in a commercial setting.

We co-designed the initial concept with the University of New South Wales and have continued to test and refine the pilot with 3 other universities (University of Adelaide, Edith Cowan University and Curtin University) and 20 students. The first cohort is now graduating and interest in the pilot program is driven by the value it creates over the standard PhD experience.

Evaluating the pilot program has shown that:

- top students are attracted to the superior scholarship package and access to a broader range of equipment and experience through 3 supervisory agencies providing integrated support
- the concept is attractive to diverse industry sectors (including engineering, med-tech, ICT and food sciences) and both large and small companies (12 out of 20 were SMEs). Industry also benefits as it provides access to new talent and improved access to CSIRO and university researchers
- researchers benefit from the program because the research is more likely to be translated and create impact in the real world
- students have a clear path to a career in industry as well as being adept at working in applied and basic research areas
- supervisors find themselves in a beneficial network of researchers and industry translation partners
- program participants derived further benefit from building new connections and finding project opportunities.

Reflecting the success to date of the pilot program the Australian Government has committed to ongoing funding to scale up the iPhD program over 10 years, as part of a broader industry workforce development program. The continuation and scale up allows Australian universities to provide more attractive career pathways in industry and encourage more students to take up a PhD, as well as continue to forge translation networks between researchers and commercial partners.

Working effectively with our university, industry and end user colleagues enables us to co-create ideas and research solutions that make a difference socially, environmentally and economically.

Building the research capacities of Aboriginal and Torres Strait Islander students

An example of creating value by building on existing relationships is the initiative started last year with our longstanding research partner, James Cook University (JCU). By developing new modalities of working with stakeholders of both organisations we aim to improve education and employment opportunities in the North for Aboriginal and Torres Strait Islander students at JCU. And, in partnership, we will build culturally relevant research capacity and clear STEM career pathways.

An impact pathway to guide the long-term design, resourcing and delivery of the initiative was constructed in partnership with teams such as the partnership Operations Group, JCU's Indigenous Education Research Centre, our Indigenous Science and Engagement team and our University Engagement team. Both organisations can use this work to meet their Reconciliation Action Plan goals, make Indigenous STEM career options more visible and build supportive research pathways for students. Together we will purposefully take the time needed to build trust with participants, try some different approaches, and achieve greater impact.

This initiative increased awareness of STEM opportunities, with 3 CSIRO STEM awards at the inaugural 2021 JCU Indigenous STEM awards celebrating the science achievements of Indigenous students. Two workshops then brought together Indigenous students and researchers as well as non-Indigenous CSIRO and JCU researchers and staff to test perspectives on what a successful research pathway would look like.

The workshop processes built a shared understanding of research pathways and explored new ways to support Indigenous student engagement in research. Workshop groups co-designed diverse ways to connect and incubate student-researcher-community networks where students can develop research interests while flexibly balancing study, family commitments and reducing financial pressures. This initiative exemplifies the value of a strong trust-based governance group, Indigenous representatives in the group and strategic co-investment in the JCU-CSIRO relationship.

L to R: Ally Lankester, Vincent Backhaus, Roslyn Hickson, Louisa Warren, Nerida Horner and Ian Watson, CU-CSIRO Strategic Relationship Operational Group members at the inaugural JCU Indigenous STEM Awards.

Food-focused collaborations for the Asia Pacific region

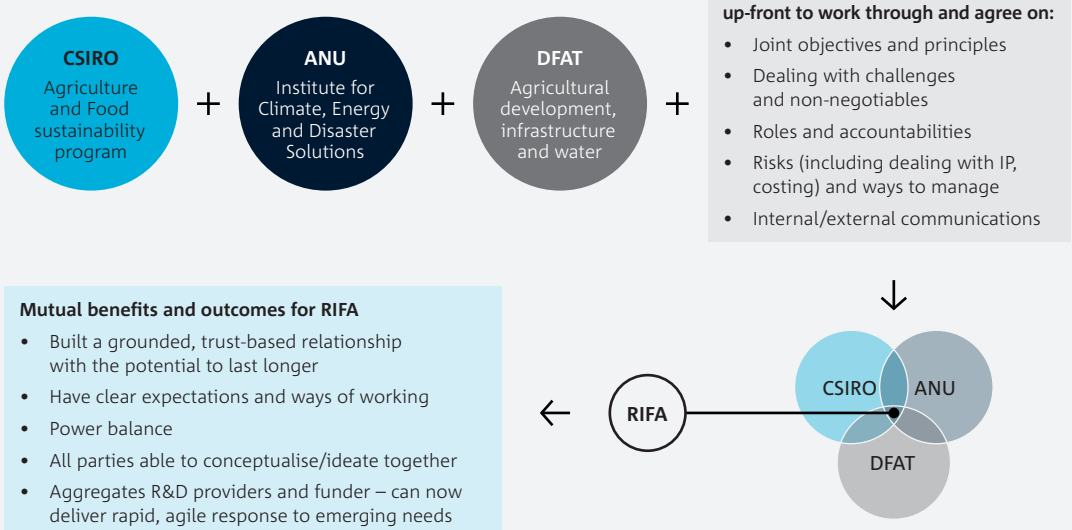
Our Resilience Initiative for Food and Agriculture (RIFA) collaboration with the Australian National University (ANU) and the Department of Foreign Affairs and Trade was launched in 2020 with the purpose of working together differently as an 'ideas incubator' and collaborative R&D platform. RIFA brings together our collective interdisciplinary agri-food expertise to share knowledge and deliver rapid science-based and development-ready solutions shaped by local Asia-Pacific contexts, to help increase regional food security and resilience.

A critical element of this platform is building a *Rapid Response and Situational Analysis Dashboard* that allows the near real-time collection of information that can be a precursor of food system vulnerabilities. Dashboard information can then be used to generate geographical food stress maps to enable governments to target resources quickly to ensure recovery. To act rapidly and deliver impact, R&D collaborators from multiple organisations need to understand each other well, have a shared vision and have minimised the barriers to collaboration. RIFA achieved this using the structured partnership process outlined below.

In 2022, we stood up another important new food R&D collaboration platform – the Food Environment and Agricultural System Transformation Initiative with the University of Queensland – also using a structured approach to partnering.

This initiative aspires to provide research and innovative solutions focused on transforming Australian food systems toward more sustainable, healthy and equitable pathways. By enhancing value in, for and from Australia's food and agriculture systems, it is intended this will drive sustainability and improve nutrition outcomes.

Australia is an active leader in the Asia-Pacific, increasingly embedded in global food systems. The initiative builds on Australia's involvement with the 2021 United Nations Food Summit events and the recommendations generated via the Summit's scientific groups; bringing coherence between global agreements and national level required action. Its overarching vision is to help build a new and evidence-based national conversation on food system transformation that is inclusive of different stakeholder visions, ambitions and values and identifies a diversity of solution pathways to Australia's food system futures. It is anticipated that this collaboration will be a multi-year activity based around four key areas: Dynamic benchmarking and foot printing; Constraints and barriers to change; Drivers and solutions that promote change; and Re-envisioning food systems.



Example of a structured partnership development process

Publicly Funded Research Agencies (PFRAs)

In 2021–22, we continued our productive collaborations with other PFRAs including ANSTO, BoM, AIMS and Geoscience Australia. Read more about our work with ANSTO, BOM and Geoscience Australia on page 68.

Cooperative Research Centres

The Cooperative Research Centres (CRC) program supports collaborations between researchers, industry, and the community to foster high-quality research and development. The program enables research teams to connect across institutions and industries to inform research priorities and take up research outputs to maximise impact. CRC grants provide successful applicants with access to grant funds for up to 10 years. Since the CRC program commenced, the Australian Government has funded 233 CRCs; 29 were active in 2021–22 and we participated in 12 of these.

We are the single biggest research organisation involved in CRCs and have contributed to more than 160 CRCs over time. When CRC research results in commercialisation, a separate legal entity is established, and our share of the new entity is treated as a subsidiary, joint venture, or associate.

CRC Projects

CRC Projects are smaller collaborations with timelines of up to 3 years and grants of up to $3 million. They develop important new technologies, products and services that deliver tangible outcomes.

Since the CRC-P's program commenced, the Australian Government has funded 189 CRC-Ps. 86 CRC-P's were active in 2021–22 and we participated in 11 of these.

This year, our total cash and in-kind (for example, staff and use of assets) contribution to CRCs and CRC Projects was $18.4 million.

This year, we became a member of the:

- Marine Bioproducts CRC – a national initiative to address the increasing global demand for agriculture products, which is estimated to grow by 15 per cent over the coming decade.
- Heavy Industry Low-carbon Transition (HILT) CRC – a national initiative aiming to enable our heavy industry sector to compete in the low-carbon global economy for carbon-neutral materials, such as 'green' iron, alumina, cement, and other processed minerals.

We also participated in the Digital Finance CRC which brings together a unique group of stakeholders in fintech, industry, research and regulation to develop and commercially exploit the huge opportunities arising from the next transformation of the financial markets.

In May 2022, the successful outcomes of Round 23 were announced, which will see us participate in One Basin CRC – aimed at connecting industry, government, research organisations and the community to deliver science-based solutions that contribute to growth and benefit rural communities and the environment to manage climate and water risks in the Murray-Darling Basin.

Rural Research and Development Corporations

Australia's Rural Research and Development Corporations (RDC) help drive agricultural innovation. They encourage Australian government and primary producers to co-invest in research and development (R&D) to benefit industry and regional communities. There are currently 15 RDCs.

During 2021–22, CSIRO engaged with 15 RDCs in new and ongoing commercial R&D contracts valued at $289.1 million.

We earned $30.2 million in earnings for our work in the year with RDCs and executed 51 new commercial contracts with 9 RDCs worth $43.8 million in total.

We have key partnerships in excess of $10 million with 6 RDCs: the Grains RDC, Wine Australia, Meat & Livestock Australia, Horticulture Innovation Australia, Cotton RDC and MLA Donor Company Limited. We also have active executed contacts with Fisheries RDC, Sugar Research Australia Limited, Rural Industries RDC, Australian Meat Processor Corporation Ltd, Australian Wool Innovation Limited, Forest and Wood Products Australia Limited, Australian Eggs Limited, Dairy Australia Limited and Australian Pork Limited.

Table 3.7: Cooperative Research Centres we are participating in

CRC	PARTNER START DATE	SCHEDULED END DATE
Innovative Manufacturing Cooperative Research Centre (IMCRC)	21/10/2015	30/12/2023
CRC for Developing Northern Australia	17/03/2020	30/06/2027
Cyber Security CRC	3/01/2018	31/12/2024
MinEx CRC	1/07/2018	30/06/2028
SmartSat CRC	1/07/2019	30/06/2026
Future Battery Industries CRC	21/10/2019	30/06/2025
Blue Economy CRC	18/10/2019	30/06/2029
Reliable Affordable Clean Energy for 2030 CRC (RACE for 2030 CRC)	16/07/2020	30/06/2030
CRC for Transformations in Mining Economies	3/07/2020	30/06/2030
Heavy Industry Low-carbon Transition (HILT) CRC	1/11/2021	31/10/2031
Digital Finance Cooperative Research Centre	1/12/2021	30/11/2031
Marine Bioproducts CRC	1/11/2021	31/10/2031

Table 3.8: Cooperative Research Centres Projects we are participating in

CRC-P	PARTNER START DATE	SCHEDULED END DATE
Smart tools for agronomic crop insights using Machine learning (ML) and Artificial Intelligence (AI)	30/01/2019	31/12/2022
Smart Sensor and Deep Learning Behavioural Engine for Personalised Health Monitoring	1/04/2019	31/03/2023
Privacy-Preserving Analytics for the Education Technology Industry	15/08/2019	14/08/2022
Using AI and a hybrid ESS solution to fully integrate solar generation into the distribution system	1/09/2019	31/08/2022
Future-proofing the salmon farming industry in the face of climate warming	1/09/2020	31/08/2023
Advanced Nano-engineered Battery for Fast Charging Catenary-free Trams	1/10/2020	30/09/2023
Manufacturing consortium for cancer radioimmunotherapy	1/07/2020	30/06/2023
Circular Economy: How To End Australia's Dependency on Single-Use Plastics	22/03/2021	21/03/2024
Advanced lipid fermentation facility for local manufacture of future foods	1/10/2021	30/09/2023
Australian manufacturing of alterative protein ingredients	4/10/2021	30/07/2023
Pre-commercial pilot trial of novel biofungicide to address Sclerotinia	1/10/2021	1/06/2024

Dual-purpose canola proves its worth

A flock of sheep feeds happily on a young canola crop. What would have once been a sight to cause alarm for farmers is now widely welcomed. Rather than being escapees that are damaging the crop, there is every chance a farmer put the sheep there on purpose for very good reason.

In the early 2000s, our Agriculture and Food researchers first theorised that canola could be a beneficial dual-purpose break crop, which is used to protect against crop pests and diseases. Evidence rapidly mounted, showing that dual-purpose canola crops – grown by mixed-enterprise farms to both be grazed by livestock then harvested for grain – would add to farm profitability, flexibility and resilience.

As the science underpinned its proof-of-concept, simultaneous industry outreach efforts saw the practice rapidly adopted by mixed enterprise farms.

By 2021 an estimated 200,000 hectares of dual-purpose canola crops were being grazed annually across Australia. In total, this led to approximately $1 billion of benefits for Australian canola growers since its field adoption in 2007. That number is expected to grow to around $1.6 billion by 2025.

Mixed enterprise farms that both grow crops and raise sheep see numerous benefits from adopting dual-purpose canola into their farming systems. The practice boosts overall stocking rates by providing extra feed, as well as increasing both meat and wool production.

Additionally, as a new utilisation of existing on-farm resources it can reduce the need to purchase supplementary feed in autumn and winter when pasture growth is low, saving farmers money. This extra feed source is especially beneficial during times of drought when feed prices increase and farms experience additional financial stress when their crops fail.

While sheep graze the crop, farmers can spell pastures, providing more feed for lactating sheep in the spring, while the earlier sown grazing crops have deep root systems that can increase access to the water and nutrient use efficiency of the farm.

Earlier in 2021, the resilience of the practice was demonstrated when a canola crop grazed by 20 lambs per hectare at Oberon, New South Wales, went on to achieve a world record seed yield of 7.16 tonnes per hectare.

The dual-purpose canola team led by Dr John Kirkegaard was honoured with the Sir Ian McLennan Impact from Science and Engineering Medal at the 2021 CSIRO Awards. The work has been facilitated by industry partners Grains Research Development Corporation, Meat and Livestock Australia, Delta Agribusiness and Kalyx Australia.

The dual-purpose canola concept has been successfully translated from inspiration to significant impact through the successful partnership of the multidisciplinary CSIRO science team and trusted industry partners.

Nutrient-rich canola is more than an oil-seed crop. It can also serve a valuable dual-purpose as a feed for sheep.

Australian-first irrigation technology saving water and carbon emissions

'When in doubt just add more' has been the necessity for many farmers who irrigate crops prior to the advent of agtech solutions to help refine irrigation strategies. Farmers strive to make every drop count to reduce their water costs and maximise their water-use efficiency while still producing high-yielding, high-value crops.

Our Australian-first irrigation technology, WaterWise, is the only water-use efficiency product for irrigated crops that 'lets the plants do the talking'. It uses in-field sensors that measure the canopy temperature of crops every 15 minutes and machine learning to apply our unique prediction algorithm. WaterWise could return up to $1 billion to Australian agriculture and save the equivalent of up to 1 million swimming pools of water by 2030.

In an independent economic evaluation of WaterWise's potential impact in the irrigated agricultural sector, RTI International found the high-tech system, has the potential to provide between $48 million and $769 million in economic impacts (present value terms, 2020) accruing to Australian agricultural producers between 2021 and 2030. The evaluation modelled various adoption and impact scenarios based on 4 of the most water-intensive agricultural crops – cotton, sugarcane, tomatoes and almonds.

Apart from environmental co-benefits including significant reductions in CO_2 emissions, the largest benefits are associated with operational cost savings through on farm use and increased yields on existing harvested areas for each commodity.

WaterWise's first customer, Goanna Ag, producer of agricultural sensing systems for water-use efficiency, started working with us in 2020 on incorporating WaterWise into their Go Field irrigation product.

Developing and commercialising breakthrough agtech like WaterWise is a feat we are one of few organisations capable of achieving. It involved a range of skill sets from agronomists to plant physiologists, data and machine learning experts, software engineers, social scientists and innovation specialists.

Our WaterWise irrigation technology is an Australian-first being used by Goanna AG on a cotton farm in NSW. Image: Goanna Ag.

WaterWise was developed as part of the Digiscape Future Science Platform and builds on earlier research co-funded by CSIRO and the Cotton Research and Development Corporation establishing temperature thresholds for cotton. Read more about our work with RDCs on page 82.

Relationships with community: outreach programs, STEM education, Indigenous engagement

Outreach programs

The **PULSE@Parkes** program gives high school students the opportunity to control the Parkes radio telescope, observe pulsars, and analyse data. The program was delivered virtually, allowing more schools from regional and remote areas to participate. In 2021, we revamped the website with more activities and resources and delivered teacher professional development workshops and sessions to over 650 students around the nation.

The **CSIRO Discovery Centre** offers an interactive journey through Australian science history and showcases our innovative science and technology. Due to COVID-19, the Centre was closed from 12 August 2021 and reopened on 1 February 2022. Significant exhibition upgrades were undertaken over this time. School visits resumed in February but numbers remained low due to COVID-19 restrictions. More than 85 schools, 5,900 students and 600 teachers participated in programs, mostly from New South Wales, Victoria, and Australian Capital Territory. In addition, 250 community members visited the Centre.

Publishing and promoting awareness of science

CSIRO Publishing operates as an editorially independent science publisher. Our publishing program of books, journals and magazines covers a range of scientific disciplines, and we are Australia's only scholarly science publisher with significant digital capabilities.

Our publications and services improve decision-making, contribute to the growth of STEM-enabled innovation, and enrich lives through access to knowledge both in Australia and internationally.

This year we released 36 book titles, with an increased number of children's books that contribute to our aim of inspiring future science champions. Digital books comprised approximately 10 per cent of sales and we co-published several titles with international partners including The Natural History Museum, London, CRC Press and CABI. Our *Double Helix* magazine aimed at 9–14-year-old students continues to spark curiosity in future generations and is now available in digital format for libraries and individuals.

Writing is an essential skill for scientists. Without it, their research remains unknown and unlikely to have an impact. Through our Scientific Writing Workshops, CSIRO Publishing has been training our scientists, university and government agency researchers to write for more than 10 years. The workshops are now presented as modular, online learning programs with highly interactive webinars, practical writing and editing activities, and regular feedback sessions. In 2021–22, over 1,100 attendees benefited from the courses we have run.

Open Access

This year, we continued our focus on finding a viable way to transition our scholarly journals publishing model to Open Access (OA), which has the potential to increase the reach of our published research while maintaining high standards of peer review and publishing practices.

OA makes scholarly outputs freely available online for users to read, download, copy, distribute, print, link to full text, crawl for indexing, pass as data to software or use for any lawful purpose, without any financial, legal or technical barriers.

In 2021–22, CSIRO Publishing more than doubled the number of OA agreements now in place with 48 university and research libraries. These agreements allow authors to access the content of our scholarly journals and publish in nominated journals at no cost. These transitional agreements are funded by the institutions' libraries via subscription fees.

Table 3.9: Science outreach: visitor centres

CENTRE	2017–18	2018–19	2019–20	2020–21	2021–22
CSIRO Discovery Centre	27,622	32,122	23,269	11,402	6,808
Parkes radio telescope	105,085	112,224	100,103	103,185	72,612
Canberra Deep Space Communication Complex (CDSCC)	69,279	68,581	47,814	22,249	4,908
Australia Telescope Compact Array, Narrabri	12,081	10,363	7,434	19,659	10,740

We currently publish 27 journal titles, 14 in partnership with the Australian Academy of Science. This successful relationship dates back to 1948. Twelve journals were produced under agreements with Australian and international societies or institutions.

STEM education

Our STEM programs provide learning experiences for primary and high school students, teachers, and the community. In collaboration with industry and our partners, we bring STEM to life for over 160,000 students nationally each year. Our programs are curriculum aligned, culturally responsive, and use best practice STEM learning methods. We promote the importance and application of our research to the community and increase Australia's STEM literacy.

We delivered more than 16 education programs, which increased interest, engagement, and achievements in STEM. This year, over 160,000 primary and secondary students took part in STEM education programs from more than 1,500 schools. More than 3,300 teachers participated in professional learning programs and experiences.

STEM Professionals in Schools

The STEM Professionals in Schools program, Australia's largest national skilled volunteering program for STEM professionals and classroom educators, is funded as a part of the Students Support Package. At 30 June 2022, 1,116 partnerships were operating in 828 schools, which consisted of 960 teachers and 929 STEM professionals from over 357 organisations across Australia. Government, Catholic and independent schools participated. Approximately 30 per cent were in regional and remote areas. An online regional and remote initiative connected professionals with teachers from regional and remote areas in all states and territories, except ACT. A suite of online support sessions also provides participants with opportunities to connect, share ideas, and hear from others in the program.

BHP Foundation Science and Engineering Awards

The BHP Foundation Science and Engineering Awards' virtual program generated almost 7,000 entries to state-based Science Teachers' Associations that nominated up to 5 projects each based on achievement and diversity.

In December, 17 primary school finalists participated in the Virtual Primary Experience 'Space Cows' and 25 secondary student finalists attended the 4-day Virtual Secondary Experience, along with student winners of the Indigenous STEM Awards. In May, 7 secondary student finalists participated in the Virtual Regeneron International Science Fair. One teacher from each state and territory participated as Teacher Finalists in the Virtual Teacher Best Practice Seminar sharing advice and perspective on teaching STEM. They were joined by 2 teachers from the CREST Program and one teacher from the Indigenous STEM Awards.

Creativity in Research, Engineering, Science and Technology (CREST)

The CREST program builds teacher capacity for facilitating open inquires. This year, CREST engaged 209 schools and students completed 2,140 investigations in science, technology, and engineering projects. We launched an Introduction to CREST e-module for primary and secondary teachers new to the program. A Silver CREST award student from NSW had her work published in the International Journal of Environmental Research and Public Health, making her one of the youngest women to publish in a peer-reviewed journal.

Generation STEM

Generation STEM is a 10-year initiative that attracts, supports, retains, and trains NSW students in STEM into further education and employment. A $25 million endowment from the NSW Government to the Science and Industry Endowment Fund supports this program.

Throughout 2021, 1,122 Year 9 and 10 students from 47 high schools participated in the STEM Community Partnerships Program (STEM CPP). Schools in regional New South Wales (Central West) participated for the first time along with those from 7 councils in Western Sydney. Virtual events were held due to COVID-19, including virtual work experience, online site visits, and virtual showcases. Industry partners assisted in running these activities and supported teachers as mentors. This year, Deadly in Generation STEM (DiGS), was launched in Illawarra-Shoalhaven and New England (specifically the Moree Special Activation Precinct area) to increase participation of NSW Aboriginal and/or Torres Strait Islander students in STEM, through Culture and on Country activities. The program was designed in consultation with the community.

In 2022, the Generation STEM initiative as a whole was active in 11 Western Sydney councils and the Central West, Illawarra-Shoalhaven, Central Coast, and New England regions. Activities included 12 teacher professional learning days, 15 community workshops (industry workshops and school information sessions), and 1 immersion day.

Generation STEM initiative sought feedback about the STEM CPP program from students, supervisors, and teachers, including through online surveys Key findings from the 112 Year 9 and 10 students' responses included:

- students' self-reported interests and attitudes towards STEM increased.
- the inquiry-learning project had the biggest impact on students' interest in STEM
- most students felt confident about doing well in their STEM subjects
- female students are less likely than male students to report confidence or desire to work in STEM
- students and teachers report that STEM CPP has positively impacted students' 21st century skills.

Participating schools and industry mentors spoke positively about their experience with STEM CPP and want to stay involved in the program.

Digital Careers

To increase interest in ICT careers, programs are run through the Digital Careers initiative funded by the Department of Industry, Science, Energy, and Resources.

The Bebras Australia challenge promotes computational thinking skills for students in Years 3–12. It is part of an international challenge to present computer science skills to students in a digestible and adaptable manner. Over 48,000 students participated this year.

CyberTaipan, a cybersecurity competition (adapted from the Cyberpatriot competition in the United States), educates and inspires students to consider careers in cybersecurity. It engaged 62 coaches and 20 technical mentors, with 142 teams made up of 540 students competing from across the country. CyberTaipan is delivered in partnership with Northrop Grumman Australia.

FarmBeats for Students focuses on data-driven agriculture and is delivered in partnership with Microsoft Australia. It aims to increase student data literacy and understanding of artificial intelligence and provides hands-on experience in using microcomputers and sensors for data gathering. The program pilot in 2021 provided 397 students from 18 high schools across Australia with microcomputer and sensor kits, lesson plans and teaching resources.

Virtual Work Experience Program

Our Virtual Work Experience Program involved 95 high school students from 52 schools. Eighteen groups worked on topics ranging from food processing, to writing articles for the Double Helix magazine, and observing pulsars using the Parkes radio telescope.

GFG Foundation Student Programme

The GFG Foundation Student Programme, an after-school package for Year 9 and 10 students, is a collaboration between the GFG Foundation, CSIRO, and Prince's Trust Australia that engages local school students in regional areas of Australia in extra-curricular open inquiry STEM projects and life skills. In 2021, it expanded to include Newcastle students, in addition to those in Whyalla, South Australia. Of the 65 students across both cohorts, 58 graduated from the program. In 2022, the program will expand to George Town, Tasmania.

Indigenous engagement – STEM projects

A series of evaluation reports highlighted the positive impact the Indigenous STEM Education Project had on Aboriginal and Torres Strait Islander students, teachers, schools, and communities. The program is funded by the BHP Foundation. The evaluation estimated that over the 2014–21 period, the project reached almost 24,000 Aboriginal and Torres Strait Islander students, 2,768 teachers and assistant teachers, and 603 schools. The Indigenous STEM Education Project influenced student outcomes in multiple ways including through direct program support; better equipping teachers and schools to deliver culturally responsive STEM education; and by celebrating best practice and individual excellence.

The evaluation reported a lasting impact on participating educators, students, and schools, and that the integration of Aboriginal and Torres Strait Islander knowledges and contexts through hands-on, inquiry-based lessons was beneficial for all students, regardless of their cultural backgrounds.

In July, an evaluation of the Indigenous STEM Awards program was finalised and we published the Indigenous STEM Awards – Stories of change: Case study evaluation report. The evaluation explored the impact of the Awards Program, recipients' Awards journey, and the changes experienced as a result of their participation in the program.

The evaluation found that Award recipients were exposed to new opportunities such as conference presentations, employment, and further study; were able to make new professional and personal connections; and highly valued the communication and media training they received. Award recipients also highlighted the impact that increased recognition and confidence had on their families and communities and the acceptance of Aboriginal and Torres Strait Islander knowledges. The evaluation of the Indigenous STEM Awards is a key input into the project planning for our new STEM Together initiative. Read about our university collaboration to build Aboriginal and Torres Strait Islander students' research capabilities at page 80.

Young Indigenous Women's STEM Academy

The Young Indigenous Women's STEM Academy provides high-quality STEM extension and engagement activities to young Indigenous women. The program currently supports 235 students across Australia from Year 8 through to university. The Academy delivered a range of virtual STEM experiences tailored to the young women's areas of interest including panel sessions with female Indigenous STEM professionals, hands-on STEM activities, virtual tours, and wellbeing activities. The academy now has 3 Indigenous women who have graduated from university with a Bachelor of Design (Architecture), Bachelor of Commerce (Accounting), and a Bachelor of Science (Plant Biology). In 2022, we commenced recruiting young women in Tasmania, Victoria, South Australia, and Brisbane North.

Indigenous STEM Awards

In 2021, an adapted Indigenous STEM Awards program was delivered, with 91 applications received. Award categories included Aboriginal and Torres Strait Islander STEM Professional Awards (Professional and Early Career), STEM Champion Award, School Award, Teacher Award, Aboriginal and Torres Strait Islander Student STEM Achievement Award (Secondary and Tertiary), Aboriginal and Torres Strait Islander Student Math Award, and Science Award. A new Dr Kaye Price AM Award for commitment, support, and advocacy was developed to celebrate excellence and leadership among Aboriginal and Torres Strait Islander STEM professionals and STEM educators. In collaboration with the BHP Foundation Science and Engineering Awards, virtual experiences were held for the secondary school winners and the teacher winner in December. The Virtual Indigenous STEM Awards gathering held in January brought together the 10 winners to yarn, share their STEM journey and network. Individual community-based Indigenous STEM Awards celebrations were then held for each winner in March and April.

Two-Way Science and Inquiry for Indigenous Science Students

CSIRO Education and Outreach collaborated with the Western Australian Department of Education to support the pilot of the Two-Way Science project that will help build understanding and respect for Aboriginal histories, cultures, people, knowledges, and experiences while strengthening the wellbeing and learning outcomes for Aboriginal students. The project is supported by providing 2 online learning modules at no cost to participants. We continue to work and collaborate with the Two-Way Science team to support the ongoing implementation of the pilot.

We also developed a Two-way Science for Australian Schools online module to introduce school leaders to the principles and methodology articulated in *Two-Way Science: An Integrated Learning Program for Aboriginal Desert Schools* resource book. In 2021–22, 54 teachers from around Australia have participated in the learning.

The Inquiry for Indigenous Science Students online learning program continues to provide teacher professional learning to embed Aboriginal and/or Torres Strait Islander cultural knowledges through hands-on inquiry-based projects for students in Years 5 to 9. In 2021–22, 104 teachers enrolled.

Collaborating internationally for national benefit

We actively contribute to the international priorities of the Australian Government by developing strategic partnerships with leading international science institutions and by attracting global investment to Australian science, technology and innovation. We also connect Australian innovation to global markets.

Our international engagement, operations and collaboration where there is a higher potential impact value return to Australia

The challenges faced by Australia, such as health, security, sustainable energy and resources, environmental health and biodiversity and climate change, are complex and intertwined with our international neighbours and partners.

We work on fundamental research right through to strategic partnerships centred around delivering impact and translation of Australian innovation. We engage with government, research institutions, industry and the innovation ecosystem strategically to attract talent and investment into the Australian ecosystem, such as our support to the Australian Government's Global Business and Talent Attraction Program.

The outcomes for the Global program include 4 key pillars: capturing the value of CSIRO and Australia's innovations and services; enhancing Australia's scientific standing and access to capability and talent to impact Australian growth; supporting Australia's foreign policy agenda through science diplomacy; and creating new pathways to global markets for the Australian innovation ecosystem and SMEs.

We use robust frameworks to assess opportunities and engagements and ensure these are in Australia's national interests. By examining both market outlook and geopolitical aspects our international partnerships minimise foreign interference risks. We work with the Department of Foreign Affairs and Trade (DFAT), Austrade and the Department of Industry, Science, Energy and Resources to contribute to programs that address global stability, economic growth and the ongoing security of our region.

Our partnerships with regions

Partnerships are core to our Global Strategy. In 2021–22, we worked with 550 international collaborators and customers across 69 countries globally. Of these, 345 are international corporations. We have delivered international engagement work on behalf of the Australian Government in excess of $20 million.

Our global partnerships and collaboration footprint leverages our entire research portfolio, creating international impact pathways with countries, including the USA, Canada, United Kingdom, France, Vietnam, New Zealand, Japan, Chile, Singapore and China.

Within the Asia Pacific region our collaborations support Australia's international policy agenda. For over 30 years we have partnered with Japan's National Institute of Advanced Industrial Science and Technology (AIST) with key focuses on energy, space and manufacturing. In South Korea and Singapore we collaborate with leading agencies such as the National Research Council of Science and Technology and A*STAR to support common national challenges.

Through the SciTech4Climate initiative we work with the Australian National University (ANU), DFAT and Indo-Pacific nations to develop and deliver solutions to build climate resilience and address inequities arising from increased climate volatility. Our program design allows us to draw upon industry partners, such as Google, to enhance the scale and outcomes to safeguard our prosperity by building our region.

In Vietnam, we're building capability and capacity in science commercialisation and industry collaboration in public research institutions, through training and mentoring in global best practice and co-developed guidance for national and institution policies as part of the Aus4Innovation program.

Excellent international scientific cooperation is important to Australia's economy. Global partnerships bring together the best science to benefit Australia.

Our work in the USA and Northern America extends across the breadth of our portfolio and is supported by our domestic team and CSIRO US, giving us unique market insights and the ability to develop significant strategic relationships efficiently. Our partnership with the National Science Foundation (NSF) in the USA enables us to develop missions-aligned collaborations to support our shared research agenda. Through this partnership Australian industry, and SMEs are able to participate in the NSF's Convergence Accelerator program, which focuses on translational technologies to address pressing global issues. Our support is enabling Australian industry and researchers to progress their research and innovation translation into the USA and other international markets.

Over 3 decades we have collaborated with the US Department of Agriculture on biocontrol interventions supporting agriculture industries and environmental conservation across both countries, we have created resilience in Australia's capability to respond to invasive species. We also continue to support the ongoing COVID-19 recovery and pandemic resilience through international consortia, in projects supported by DFAT and the US FDA.

By creating deep partnerships and scaleable business models, we are connecting Australian innovation globally and creating a legacy of sustainable opportunities for our research, innovation, and Australian industry.

Through the Indo-Pacific Plastics Innovation Hubs we are bringing together research, start-ups, NGOs, investors, industry and government to address plastic waste, with hubs established in Indonesia and Vietnam, and a third under development in the Mekong region. Along with Department of Foreign Affairs and Trade (DFAT) and local governments we are co-designing and identifying key challenges to be solved by creating and implementing deep-tech solutions. This can create momentum to build solutions to pressing global challenges while developing new industries and establishing opportunities for Australian start-ups and industry to enter and shape the emergence of a new circular economy across the region.

Working in partnership with Australian and Indian research and industry we are solving challenges critical to both countries and working to develop Australia's industries of the future.

The India-Australia Critical Minerals Research Partnership will strengthen supply chains, add value to Australian exports, and work with India to commercialise critical minerals technology. It will contribute to diversified, resilient, and responsible supply chains, creating new jobs and industries for Australia and India. It will work to realise the commercial benefits of integrating Indian and Australian critical minerals value chains, by proving the commerciality of Australian critical mineral processing Intellectual Property in Indian and Australian contexts.

The development and deployment of innovative technologies and export diversification pathways will be supported through the India-Australia Green Steel Partnership, planned to deliver jobs to the resources sector in the transition to a low emissions economy. It will leverage our relationships with Australian industry, the Indian Government and Indian industry to support commercialisation and improve efficiencies and environmental outcomes in steel production. This partnership will help India meet its growing steel requirements, deliver on our shared vision for lowering emissions and help diversify Australian exports.

Across the Indo-Pacific, we are building resilience and capacity across human and animal disease preparedness and response. Capability development and laboratory twinning programs provide health resilience, fortify agriculture and food production resilience across the region and help sustain the health and wellbeing of Australia and our agriculture industry.

Through the $30 million Australia-Singapore LET hub initiative, we are creating the ecosystem to accelerate the deployment of renewable low emission fuels and technologies in maritime and port operations, and at less cost. The hub will draw together bilateral government support, venture capital and industry, providing opportunities for the demonstration and deployment of prototype concepts and systems of later stage technologies into the Singapore maritime industry creating a platform for Australian technology, industry and SMEs to validate technology and enter the LET maritime supply chain or deploy in Australia.

Read more about our international work on pages 92–95.

Collaborative energy research to transition the electricity system

The Global Power System Transformation (G-PST) consortium is an international group of electricity system operators collaborating with leading international researchers to accelerate the transition to low emissions, low cost, and reliable power systems.

In 2021, CSIRO and the Australian Energy Market Operator (AEMO) announced their joint leadership on behalf of Australia in the G-PST consortium, bringing together a team across the Australian innovation sector, including Monash University, UNSW, Aurecon, GHD, EPRI, the University of Melbourne, RMIT University, and global consultancy Strategen. Initial work was presented in a special session at the 2021 UN Climate Change Conference (COP26).

CSIRO's annual GenCost report has confirmed that the cost of renewable energy is no longer the challenge – instead, integrating renewable energy securely and efficiently into our electricity systems, and ensuring we have the right operational tools and capabilities in place, is the challenge. Australia has some of the world's highest levels of rooftop solar, which means this challenge extends throughout the electricity system – from the largest generators through to efficiently integrating 'distributed energy resources' (such as solar and electric vehicles) into homes and businesses. The nation is also seeing a significant increase in renewably-generated electricity, combined with an increase in electricity requirements in other sectors, such as transport, buildings, manufacturing and mining.

CSIRO is developing new technologies and intelligent systems to manage the way electricity is generated, transmitted and used. By implementing these solutions, we can ensure our electricity systems are affordable, reliable and sustainable well into the future.

Australia's electricity systems face several key challenges, including management of rapid change, ageing infrastructure, increasing complexity, and the need for investment in transmission and distribution.

In early 2022, the CSIRO and our G-PST collaborators delivered an Australian Roadmap highlighting the research required to support the evolution of Australia's electricity system, showing that continued innovation can drive the integration of renewables and guide a smoother transition.

The Roadmap posed key research questions, informed by international challenges, and adapted to our specific Australian context to support the nation's energy transformation in the long-term interests of consumers – maintaining reliability, security and cost effectiveness while decarbonising the Australian electricity sector. It summarised the outcomes of nine individual research plans, including their criticality to Australia's energy transformation.

The Roadmap targets areas that will ensure ongoing energy security and reliability for Australian consumers, and an efficient and effective investment in infrastructure. It prioritised the role of research throughout this transition, noting that Australia is well-equipped to lead the charge.

The Australian G-PST Roadmaps provide a meaningful and holistic solution to the Australia's electricity transformation. Following industry consultation, CSIRO and AEMO have now begun implementation of the identified roadmap priority, building Australian capability and creating the technological stepping-stones for further innovation while remaining flexible to this rapidly changing challenge.

With roadmap implementation now underway, new partners and opportunities to further accelerate this work are being sought.

Proficiency testing strengthening our region's biosecurity

The need for Australia to actively participate in the biosecurity of the Asia-Pacific region is more important than ever before. The risk of infectious diseases transmitting from animals to humans has increased due to the geographic expansion of the population, habitat disruption, and increased global trade and travel.

The Australian Centre for Disease Preparedness (ACDP) plays a critical role in animal disease research and investigation, protecting the public, livestock and aquaculture industries from highly pathogenic emerging diseases. Read more about the ACDP at page 58. This work responds to the Australian Government's key priority areas, including biosecurity, market access, international relationships and building domestic human capital.

One of the biggest barriers to successful microbiology research is accurate laboratory testing. This is particularly important when detecting, diagnosing and treating viral pathogens, which is required for robust disease surveillance. Laboratory testing needs to be conducted at the highest possible standard globally to ensure reliability, accuracy and precision.

To minimise laboratory deficiencies, proficiency testing is an external assessment of testing and measurement capabilities that provides additional assurance to internal controls being used by a laboratory. Proficiency testing is often accompanied by backstopping missions, where field visits are completed by experts to provide an additional layer of assurance.

Despite Asia producing most of the world's aquatic animal products, only ad-hoc proficiency testing occurs for a limited selection of diseases. For the last decade, ACDP has played a leading role in transforming proficiency testing in the Asia-Pacific to a proactive and strategic scientific tool that actively manages biosecurity risks.

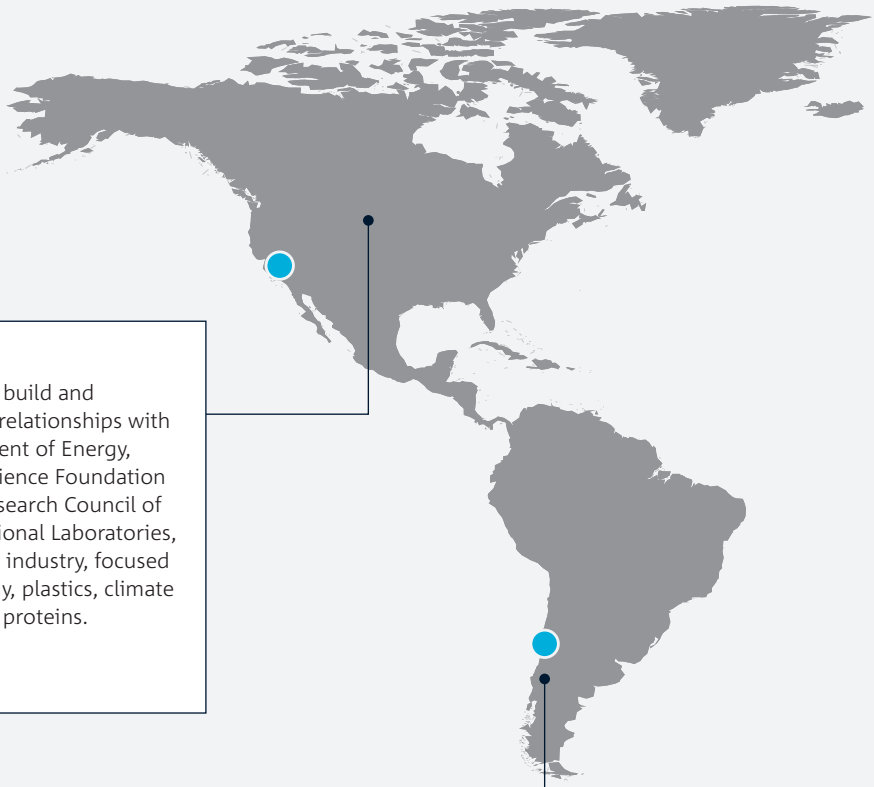
We have provided funding, diagnostic expertise and training to 39 animal health laboratories across 14 countries. This proficiency testing is estimated to provide an impact value of $7.06 million. Our leadership has strengthened the Asia-Pacific's epidemic preparedness and continues to support a safe and secure Australia.

The Bioassay Research and Development team helps develop bespoke reagents needed for new diagnostic tests and assays.

Our global reach

We have a strategic presence in international locations to support and focus our global engagements. We have two international offices in the Silicon Valley, the United States of America (USA), and Santiago, Chile, and one laboratory in Montpellier, France. We also have accredited science counsellors attached to Australian embassies in Singapore, Vietnam, Indonesia and the USA.

We deliver connectivity to global science and technology, working on projects in over 50 countries across a wide range of industry and sectors.



USA

We continue to build and strengthen key relationships with NASA, Department of Energy, The National Science Foundation US, National Research Council of Canada, US National Laboratories, universities and industry, focused on space, energy, plastics, climate tech and future proteins.

705 20

Chile

We have delivered new tools and knowledge to help government and industry understand and adapt to future climate scenarios. We are providing new approaches for integrated water management, science-based governance and sustainable energy solutions.

47 1

JOINT PUBLICATIONS

MOUs

CSIRO OFFICE

CSIRO LABORATORY

EMBASSY REPRESENTATION

View our locations on page 120.

France

We maintained our footprint in Europe with the CSIRO European Laboratory. We are forging new partnerships with French and European collaborators to focus on energy, agriculture, biosecurity and quantum research.

257 2

Republic of Korea

We continue to work with research institutes under the National Research Council of Science and Technology in mineral resources research and renewable energy. We are forging new partnerships in advancing technologies for hydrogen supply, low emissions steel and iron ore, and Carbon capture, utilisation and storage.

68 5

Japan

We are strengthening and building new partnerships in Japan to accelerate our collaboration in decarbonisation technologies in hydrogen, negative emissions and Carbon capture, utilisation and storage.

160 12

India

We received $43.2 million from the Australian Government to partner with India for five years in the areas of green steel, critical minerals, and an innovation and technology challenge program.

104 5

Vietnam

We are continuing to manage Aus4Innovation, an official development assistance program, in partnership with the Department of Foreign Affairs and Trade and Vietnam's Ministry of Science and Technology in the impact areas of agriculture and food, and digital transformation.

26 5

Singapore

We are working to deepen our strategic partnership with A*STAR, building on our collaboration on Food for Precision Health and expanding our work on low emissions technologies to open export market opportunities.

54 1

Indonesia

We are working across multiple projects, including COVID-19 recovery, climate change resilience and adaptation, the blue economy and ending plastic waste.

28 2

TiWi: Developing low-cost titanium wire from waste for additive manufacturing

There is a lucrative market for 2.5 to 3 millimetre titanium wire as feed for Sciaky electron beam manufacturing and Wire Arc Additive Manufacturing (WAAM) – processes that melt the wire to form beads that stick together to create a layer of metal material that is then built up to form a 3D printed part.

In a global market worth over $200 million (AUD), however, Australia has no sovereign capability in titanium wire manufacturing and currently sources wire for these processes from overseas.

Turning waste into wire

In an Australian first, we developed a novel and innovative process for turning inexpensive titanium alloy waste into a high-value wire product suitable for the additive manufacturing market. The patented wire extrusion process, which is optimised using computational modelling, is on track to produce 50 kilograms of titanium wire (TiWi) at pilot scale by December 2022. The team will then work to scale this up to 100–300 kilograms pre-commercial volumes over the following months.

Our wire will be benchmarked against what is produced overseas, but it will be much cheaper because it is made from waste product.

Impact – growing an Australian sovereign capability and boosting global competitiveness

Our titanium wire can be used for wire additive manufacturing or to produce powders to use for making complex 3D printed parts suitable for aerospace, biomedical and automotive industries.

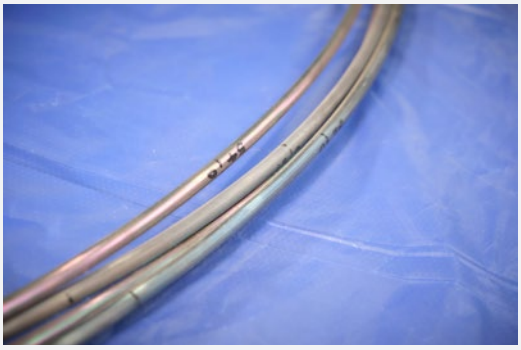
We are currently in negotiations with venture capital and Australian companies to commercialise our process and start making home-grown titanium wire here in Australia. There is also interest in the technology from international companies, with the war in Ukraine leading to a changing market situation that has improved the cost economics of the technology.

Where to now

We've proven our process, producing copper wire from copper rod and now we're transitioning to make pre-commercial amounts of titanium wire at pilot scale. The next step is to prove precommercial volumes, then qualify the wire for end use with industry partners, particularly for powder production and component manufacture.

This research was supported by the Science and Industry Endowment Fund.

Titanium machine turnings, also referred to as chips, can be turned into titanium wire after conditioning.



Our wire production process has been demonstrated at pilot plant scale for 5 to 12 mm diameter product produced continuously up to 10 m in length.

High performance glass beads keeping us safe on the roads

High performance glass beads must comply to Australian and New Zealand Standard AS/NZS 2009 and are regularly certified through the Australian Paint Approval Scheme (APAS). The availability of independent testing laboratories appropriately accredited to test these glass beads in Australia has diminished to the point of no such services being offered beyond 30 June 2022, causing confusion and anxiety in the industry.

Discussions between the APAS and our materials testing laboratories in Clayton will allow the development of appropriately accredited glass bead testing to kick off in July 2022.

The APAS auditors have inspected and approved the laboratory's procedures and processes and the National Association of Testing Authorities (NATA) accreditation with an independent technical assessor is imminent. This work will allow for fully independent testing services to the market and for the identification and assessment of testing potential for future innovative road line marking materials.

This builds our suite of capabilities to support the infrastructure sector, making it safer for its users.

Glass beads are an integral component of road line markings and make them highly visible and reflective in the dark.

Tiny retro-reflective glass beads are added to the product during either the manufacturing or the road laying process.

Investing in national challenges

Science and Industry Endowment Fund

This year, the Science and Industry Endowment Fund (SIEF) continued its strategic purpose of investing in scientific research and technology that addresses national challenges. Recognising that science has been, and will be, a key driver of Australia's economic, industrial, environmental and cultural development, SIEF invests in research that contributes to the sustainable growth of Australia, supports technology development and commercialisation and STEM education pathways and employment in New South Wales. Read more about SIEF in Part 6.

The Experimental Development Program (EDP) addresses the gap in funding for progressing technology development to a stage suitable for attracting commercial investment and market uptake. Engagement with industry is an intrinsic part of each project, ensuring that technologies meet industry's and society's needs. The program increases the rate of research translation in the innovation system by supporting research organisations in demonstrating that their technology meets Australian industry's needs and encouraging uptake by industry, thus delivering impact for the nation. See pages 189–209

The TranspiratiONal EDP project, aims to increase farm productivity and improve environmental outcomes for farmers using a water-based sprayable, biodegradable polymer membrane that is applied to the soil surface. This membrane replaces the black plastic used to suppress weeds and retain moisture, directly addressing the environmental costs associated with plastic pollution. The project aligns with the Australian Government's Science and Research Soil and Water Priority.

The SIEF funded field trials demonstrated the in-field biodegradability, non-toxicity and performance of the technology. The support also helped prove the high-scale manufacturability of the formulations and provided valuable experience in the farm-scale application of the membrane. Successful uptake of formulations is expected to create new services, products, experiences and market niches in Australia as well as open new export opportunities, especially in the Asia Pacific. Read more about the project on page 194.

The Future National ICT Industry Platform Program provides funding for large-scale research activities (Digital Initiatives) in information and communications technology for the benefit of Australia. It creates new Australian technology-based industries or applied technology platforms to deliver impact for the nation that can reach a global scale. The Genomics Digital Initiative will advance genomics and 'omics science that will transform the crop breeding process and enhance traditional farming practices, leading to increased profitability and food security. The knowledge gained can address the challenges and opportunities raised by population growth, climate change and globalisation. This aligns with the Australian Government's Science and Research Food Priority. Read more about the project on pages 109 and 195.

Analysis of performance

Our efforts this year contributed to us delivering towards our outcome (see Table 3.10) to increase the rate of research translation in the innovation system programs and through investments that create new ventures and other outcomes to deliver impact for the nation.

Consolidated analysis of performance

Building strong, collaborative relationships

The value created by collaborative relationships this year was demonstrated by the following partnerships:

- We began a strategic and continuing partnership with Google focused on Artificial Intelligence (AI) to pursue collaborative projects. A key outcome of the partnership has been Google's foundational membership in the National AI Centre and working as a partner to protect the Great Barrier Reef with AI.
- Our collaborations included tackling plastic waste and creating a circular economy. The establishment of the Indo-Pacific Plastics Innovation Network with the Indonesian and Vietnamese nodes now launched is evidence of our success in partnership and collaboration.

Collaborating internationally for national benefit

Evidence of national benefit was demonstrated in the following 3 case studies:

The South-East Asian data cube

This is based on the work that we have undertaken with Geoscience Australia to support the growth and implementation of Earth observation based products and services in South-East Asia.

The Earth Observation for Climate Smart Innovation project (EOCSI) uses a new Earth observation analysis platform powered by our Earth Analytics Science and Innovation hub (EASI) that uses Open Data Cube technology. This platform can be used for the development of climate smart applications.

The EASI technology operates in a Cloud environment that gives users access to vast quantities of openly licensed satellite data without the need for local storage or supercomputing infrastructure.

Users can then interrogate this data to better understand their local natural and built systems, such as tracking urban encroachment, deforestation or coastline degradation.

USDA Biosecurity Partnership

The United States Department of Agriculture, Agricultural Research Service, Australian Biological Control Laboratory (USDA-ARS, ABCL) is based at CSIRO Biosecurity at the Ecosystem Sciences Precinct in Brisbane and our facilities are shared with the Queensland State Government. This team has 3 decades of history and its mission is to locate and evaluate biological control agents of plants native to Australia and Southeast Asia that have become serious weeds in the United States.

Investing in national challenges

The Science and Industry Endowment Fund (SIEF) continued its strategic purpose of investing in scientific research and technology that addresses national challenges. The TranspiratiONal project and the Genomics Digital Initiative both address Government priorities (details on pages 194 and 195).

Table 3.10: Summary of performance on the stimulation of innovation for Australian industry, academia and government

FOCUS AREA	METRIC*	TARGET	RESULT
Building strong, collaborative relationships	Demonstrated evidence from the value created from deep R&D collaborative relationships with mixed methods, including joint publication, formal partnerships and qualitative assessment	Maintain or increase the value created using mixed methods	**Achieved**: Multi-agency partnerships were established with large corporations, including Google, Commonwealth Bank of Australia, Indo-Pacific Plastics Innovation Network and the US National Science Foundation to pursue collaborative projects. Worked with a number of universities in collaborative research projects.
Collaborating internationally for national benefit	Demonstrated by an increasing annual portfolio of impact case studies on global activities, with specific assessment of the value created and national benefit	Evidence of national benefit demonstrated (3 case studies)	**Achieved**: In 2021–22, we completed 3 impact case studies that demonstrated the value and benefit delivered to Australia through our global activities, particularly in ensuring a safe and secure region and supporting our industries. These included: South-East Asian Open Data Cube, USDA Biosecurity Partnership, Ocean observation.
Investing in national challenges	SIEF invested in programs aligned with published strategic objectives that address national challenges and contribute to Australia's sustainable future	Evidence by an impact case study or evaluation for each active SIEF program	**Achieved**: case studies included: TranspiratiONal (page 194), Genomics Digital Initiative (page 195), SIEF also invested in the titanium wire project, (page 96).

*Source: Corporate Plan 2021–22

Enabling capabilities

Outcome

Our enabling capabilities help us to deliver our key activities and achieve our purpose.

We invest in our people and build on existing activities that underpin our objectives and purpose. We emphasise our purpose and values to ensure that we have a sustainable business foundation. In 2021–22, our key priorities continued to be our strong commitment to diversity and inclusion, the health and well-being of our people and enhancing our positive culture.

Our people

People are our greatest asset and we are committed to creating a thriving culture that supports collaboration and creativity, fosters individual growth, provides equal opportunities and a safe environment for our people. Details of our people, numbers and staffing trends are on page 117 and at Appendix A.

Learning and leadership development

Implementing our new leadership capability framework has been a priority. It has underpinned our leadership development experiences and our talent management practices. The 'Spark' Labs program, a new leadership development experience from the CSIRO Learning Academy, has already engaged more than 180 of our leaders from across the organisation, with an initial focus on helping them with leading hybrid teams, decision making and communicating with influence.

Our Digital Academy expanded its product range to enable further growth of digital skills across the workforce. The Coaching for Women in Digital program, Digital Fitness App, Pluralsight and DataCamp online learning platforms are all enabling our people to explore digital career and growth opportunities and help unlock our digital transformation ambitions.

The Learning Academy also invested in significant uplift of the Early Career Researcher 'Trust in CSIRO Research' programs, Project Management Practice offering and a number of other learning solutions developed in line with the capability growth insights drawn from our Business Unit level Strategic Workforce Plans.

Succession planning and talent development

Our new enterprise leadership development experience, Elevate, launched this year. It accelerates the development and readiness of our high potential leaders for enterprise-level roles and contributes to our robust succession pipeline for critical leadership roles. Identification of further critical talent segments remains a priority in 2022–23. Talent development has also invested in The Future Women Platinum+ digital networking program, supporting the development of 20 mid-level female leaders.

Health and safety performance and staff wellbeing

Culture and wellbeing

Bringing out the best from thriving culture and teams in CSIRO

Our CSIRO culture program is a targeted program of people engagement, organisational values, diversity and inclusion, and leadership development initiatives that include embedding our values as the foundation for how we work together at CSIRO.

Organisational culture

This year, we measured our culture using the Denison Organisational Culture Survey, which assesses the elements of culture aligned with business performance.

Early insights that support our success include being clear and aligned around our strategic direction and purpose, sharing information widely across the organisation, and being oriented towards teamwork. The results suggest we can have greater impact by demonstrating accountability, working across boundaries, and providing more visibility of how we're tracking against our goals and objectives.

We are continuing to explore and embed the insights in key organisational initiatives such as the Ways of Working Program to continuously review and improve how we work together.

Organisational values

We have continued to embed our values (People first, Further together, Making it real and Trusted) into processes and procedures, to drive culture change and reward values-aligned behaviour. In the last year, values-aligned behaviour was explicitly added to our rewards and promotion procedure, and we began work connecting the CSIRO Awards more closely to our values. Recognising that the second most spoken first language in CSIRO is Mandarin, we worked with Mandarin speaking staff to translate our values into Mandarin, to coincide with the Lunar New Year. This was an opportunity to raise the profile of the values and to drive cultural inclusion more broadly.

Enhancing our positive culture

Sustainable Engagement Score

Engagement measures an employee's connection to their organisation and is closely correlated with productivity and performance. In our March survey, we achieved 76 per cent positive responses to engagement questions, which is 5 per cent below our target of 81 per cent. Our engagement remains high and is close to pre-COVID levels from 2019, and similar to other Australian organisations.

Ensuring staff safety and wellbeing

Staff wellbeing responses

This year, we heard from 3,590 of our people in an organisational survey to explore our culture, engagement and wellbeing. Our people reported a 65 per cent favourable response about their wellbeing, which is 3 per cent lower than the previous survey period in March 2021. Prolonged impacts of living with COVID-19 are being felt, with reductions noted in people's perceptions of their overall health status.

We continue to monitor the impacts of COVID-19 as more of our people return to sites and work in a hybrid manner.

HS-Me Day

For our annual HS-Me Day we encouraged our people to do whatever they felt they needed to do on that day to focus on their health, their safety, and/or their wellbeing – including not working at all. Read more about HS-Me Day on page 104. In addition to our regular programs that focus on improving our people's wellbeing, we offered additional support for our people to get expert advice on their ergonomic setup at home and at work in recognition that this is a major contributor to wellbeing.

Diversity, inclusion and belonging

By integrating diversity, inclusion and belonging principles in all that we do, we maximise our own potential but also understand our responsibility in creating environments where all people can grow, contribute and succeed. As we move towards refreshing the Diversity Inclusion and Belonging Strategy 2023–26, our focus will be on empowering our people to be active bystanders and allies, understanding the role that intersectionality plays in everyday practice, and strengthening the capabilities of our workforce, particularly inclusive leadership.

The new Strategy will provide an overarching holistic framework, with goals and targeted objectives that will assist us to deliver impactful actions, plans and initiatives, with a focus on gender equity, Indigenous Australians, people with a disability including neurodiversity, faith and cultural diversity, and LGBTIQ+ communities.

L to R: Bianca Moiler, Linda Stalker, Louise Fisher and Claire Jordan-Peters at the craft morning we had on HS-Me Day. CSIRO people could pop in and get help with clothing alterations, learn to crochet or connect with each other by spending time knitting together.

We contribute to 2 significant national programs to advance gender equity: Science in Australia Gender Equity (SAGE) and the Champions of Change Coalition.

Our Chief Executive has been a member of the Champions of Change Coalition STEM Group since 2015. Recognising that COVID-19 was escalating the already rapidly changing use of technology, Dr Marshall sponsored a collaborative project to develop 12 specific commitments for the Champions of Change Coalition leaders to achieve gender equality in the digital economy.

Achieving SAGE Bronze accreditation in 2018–19 was a monumental achievement, and we continue to build on this by implementing our 5-year SAGE Bronze Action Plan to address cultural, systemic and pipeline barriers to equity, with a focus on intersectionality and gender.

We completed 68 per cent of our SAGE actions and continue to remain committed to gender equity, diversity and inclusion through our pathway to SAGE Silver accreditation. We remain focused on measuring the impact of our actions and understanding the systemic and cultural barriers to equality through the SAGE process.

Our people shared stories via a fortnightly 'In the home' series to support each other while working from home during COVID-19 disruptions, particularly those with caring responsibilities. We included specific consideration of the impact of COVID-19 and natural disasters in our merit-based promotion applications and encouraged our people to take this mitigation step to support their ongoing career development.

We continued building our workplace response to domestic family violence and abuse, acknowledging the implications of our people working from home and the increased frequency and severity of domestic family violence and abuse reported globally. We provided our people with information and guided our leaders. A motivated network of trained domestic and family violence and abuse contact officers and human resources staff support our people when they need it most.

Disability remains a key focus for CSIRO. The Shine@CSIRO network (a group for people with a disability, those caring for family members with a disability, and allies) is an important element in improving the accessibility of our systems and frameworks.

This year, we launched our Diversity, Inclusion and Belonging Representative Council, bringing together representatives from across our business areas and diversity networks. The Council will advance our shared purpose; increase communication and collaboration; foster peer-to-peer support, learning and best practice; and embody our organisational values.

Diversity in leadership

We remain committed to increasing the diversity of our leadership teams across all levels. During 2021–22, our proportion of women in leadership positions increased from 37.6 per cent to 41.1 per cent. When broken down by function, the relative percentages of leadership roles held by women has continued to increase for research and enterprise support roles with 30.6 and 61.1 per cent respectively. The proportion of technical leadership roles held by women has seen a slight decrease to 10.7 per cent.

While the continued upward trend of leadership roles held by women at CSIRO is a great result demonstrating impact from our ongoing commitment to gender equity initiatives, we are increasing our focus on intersectionality of our leadership teams as reflected in our goals for diversity, inclusion and belonging. The need for these initiatives is highlighted by the fact that the proportion of leadership roles held by people from non-English speaking backgrounds has remained steady at 17.8 per cent despite the total representation of staff from a non-English speaking background increasing slightly to 24.9 per cent. Of these leaders from a non-English speaking background 35.3 per cent of roles are held by women with 65.5 per cent of these in research roles. As we refresh the Diversity Inclusion and Belonging Strategy 2023–26, with a focus on inclusive leadership, we look forward to continued achievements in this area.

Pride@CSIRO

Our Pride@CSIRO network has been instrumental in embedding lesbian, gay, bisexual, transgender, intersex and queer (LGBTIQ+) inclusion throughout our organisation and representing the experiences of LGBTIQ+ people.

We achieved Silver Employer status and were placed in the top 3 of that category, at the annual Australian LGBTQ Inclusion Awards. This is judged by external assessors against the Australian Workplace Equality Index (AWEI) and a survey measuring employee opinions on workplace LGBTQ inclusiveness.
We participated in the Sydney Gay and Lesbian Mardi Gras Parade with 40 marchers united by the theme: *Power to Shine*. We also celebrated our sixth Wear It Purple Day as part of our inaugural Diversity Month, where the theme *Start the Conversation...Keep it Going* was explored through a range of events.

CSIRO continues to identify and drive systemic changes in procedures and reporting to improve acceptance and comfort within the workplace.

Safety and wellbeing

We are consistently building our safety maturity and supporting processes, systems and frameworks in support of zero harm to our people and partners. We remain committed to ensuring our peoples' health and wellbeing and that everyone goes home safely, every day.

The 4-year Health, safety and environment (HSE) plan was reviewed in January to ensure the currency and relevance of the plan in changing circumstances. We continue to focus our efforts to empower our people in being personally accountable for their own health and safety and to minimise environmental impacts. A revised set of priority project streams has been defined including:

- HSE Systems
- HSE Risk Management
- Reporting and Analytics
- Capability
- Health and Wellbeing.

We continue to build the HSE management system to support our commitment for working safely, looking out for the safety, health and wellbeing of those around us and minimising our impact on the environment. The system empowers our people by helping them to make informed decisions in their science and in their business. It fosters a positive culture by acting as the mechanism where decisions are informed by an appraised assessment of the HSE risks and opportunities associated with how we conduct our activities and our business.

L to R: Chris Gerbing, Suzie Drummond, Gail Fulton, Kirsty Hall, Jessica Stromberg and Chris Bordin at the annual Australian LGBTQ Inclusion Awards.

In July, we rolled out the first module of our HSE digital platform, an integrated hazard, incident and risk management and reporting solution. The platform provides a seamless user experience accessible to all our people – in a laboratory or out in the field – and information analysed to inform risk assessments, safe ways of working and longer-term HSE improvement strategies. In November, we launched the second module, HSE Risk, which is a step change in providing transparency and cross organisation learning in the approach to identifying and mitigating HSE risks. The third module, HSE Audit, is well into development. This will provide systematic, planned assurance across the organisation to verify that risk management is robust and embedded.

The COVID-19 pandemic brought challenges for our people as we continued to support most of our people who were working from home. There was significant support for the Work From Home (WFH) equipment package and we ran regular check-ins and welfare checks at the state level to maintain contact with our people.

A key focus of our Health Strategy launched this year is on prevention strategies to support mental health. Mental Health First Aider (MHFA) training is being rolled out to our people to assist in building stronger awareness levels and support for mental health across CSIRO. The Virgin Pulse GO (a walking/running team fitness program) ran for 8 weeks with significant participation across the organisation. We also promoted the Fitness Passport program in conjunction with local gyms and fitness centres across the country.

In October, we held our annual HS-Me Day, in a very different manner. Due to COVID-19 and listening to feedback on screen fatigue, we gave everyone a day for themselves to focus on their wellbeing in a way that was meaningful to them. In the leadup to the day we held webinars on how you could focus on your health, personal safety and your local environment, and active sharing was promoted. Overall, the day was well received. Many commented that having permission to have a free day and for all of us to take the same day was very supportive. A subsequent reconnect day hosted by the Chief Executive, the People Executive Director, and the Chief Scientist was well attended.

We continue to maintain our working safely efforts whether at home or onsite and continue to adapt our people to return to site in a safe and positive manner. This year, we ran virtual and hands-on ergonomic sessions with physiotherapists and ergonomists to better support our people in minimising over-use injuries both at home and in the office.

Health and safety performance

HSE performance has been positive as many people worked from home during the last year. The HSE reporting system has provided transparency of performance data to our people, which is allowing teams to take more control of their results.

We recorded fewer total recordable injuries compared to last year and our total Recordable Injury Frequency Rate dropped from 3.7 to 3.0. Medical treatment injuries have held steady this year (28), slightly increased from last year (22), but there have been significantly less lost time injuries (13 compared to 22 last year).

Last year, we updated our definitions to be more industry aligned and we updated the Serious Lost Time Injury metric with a significant incident metric to capture significant near misses and incidents. The target for this metric is zero.

Regulatory notifiable incidents reported to Comcare and other regulators decreased from 8 to 3. Two were dangerous incidents and one act of aggression by an external. All incidents prompted rapid investigation with corrective and preventive actions put into place. We continue to share HSE alerts and lessons learnt arising from incidents across the organisation.

The Enforceable undertaking we are delivering with Comcare as a result of a health and safety incident in 2017, is on track with several initiatives completed:

- Develop and deliver a Virtual and Augmented Reality Risk Management training package that will enable staff to walk through scenarios in the workplace.
- Expand our risk management processes for all new projects before they start, ensuring that HSE risks are identified and controlled at the earliest possible stage *(complete)*.

- Develop specialised guidance material for working with high-risk infrastructure in environments that are potentially hazardous due to the materials or equipment present that can be used for all national research facilities in the country *(complete)*.

The full undertaking and general information about our Enforceable Undertaking is available at comcare.gov.au.

Hazard reporting

HSE contacts and hazards continues to improve as people return to working on site. The reporting system has made reporting easier and more transparent. There were 771 hazards reported this year, compared to 491 last year, but this is still below our target of 1,080. We expect this number will improve as we progressively return to site with the changes in COVID-19 conditions.

Indigenous engagement and employment

Indigenous engagement

Our ongoing collaborations with Aboriginal and Torres Strait Islander communities are helping us to develop innovative solutions to address a range of challenges. This year, we partnered with Aboriginal and Torres Strait Islander communities across 60 projects to create ground-breaking solutions through our science and technology.

Partnerships like the Centre for Appropriate Technology (CfAT), an Aboriginal owned and operated ground segment provider in Alice Springs, has enabled Australian researchers to access the Earth observation satellite NovaSAR-1. The opening of the NovaSAR-1 facility to the innovation sector represents a step change for Australian research and an important step forward for our space industry. Read more about NovaSAR-1 on page 33.

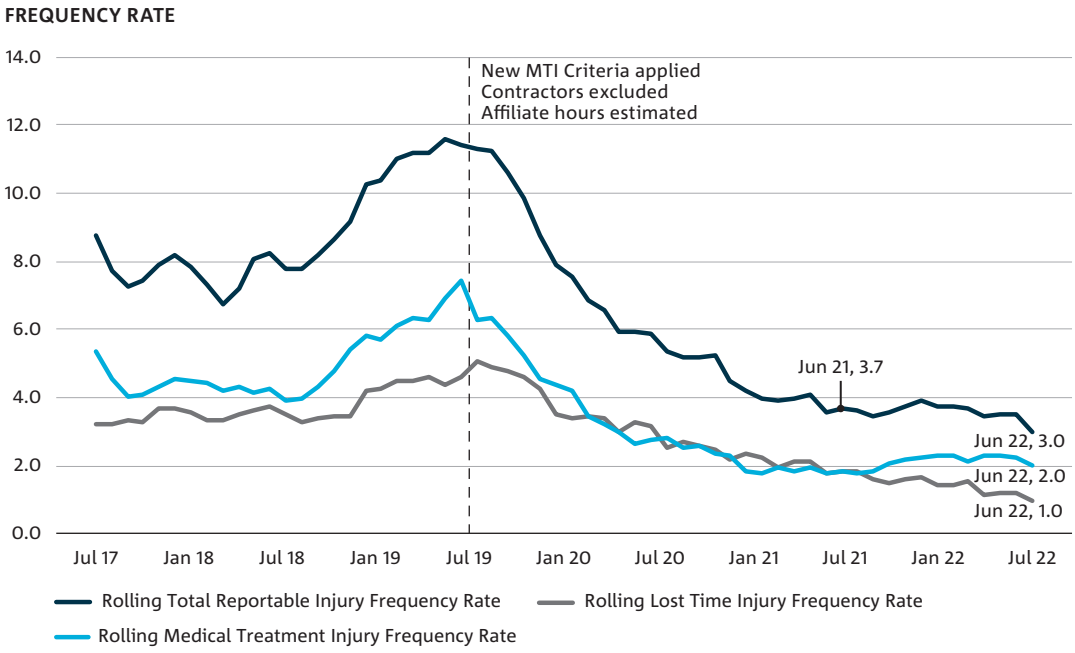


Figure 3.6: Our recordable injury frequency rates

Notes: Frequency rates are per million hours worked previously identified Severe Lost Time Injuries are now accounted for in the LTIFR. From 1 July 2019 there were criteria changes: Contractor incidents are excluded from the Frequency Rates, Hours Worked for Affiliates are estimated and added, and MTI definition is changed.

We launched the following:

- A program to bring together Indigenous rangers, tech companies and research organisations to co-design a digital skills training program to deliver environmental, cultural and economic benefits for local Indigenous communities and land management. This collaboration with the North Australian Indigenous Land and Sea Management Alliance, the Telstra Foundation, Microsoft, the Australian Government's National Environmental Science Program Resilient Landscapes Hub, and the Women in STEM and Entrepreneurship program will mobilise the latest digital technology for land and sea managers working in remote regions of northern Australia. Read more about this on page 21.
- Weavr, a digital inclusion and innovative tool developed in collaboration with an Indigenous owned software company, the Queensland Government and MEGT. Weavr is the first Indigenous designed software product to support organisations to customise, track and effectively report on their Indigenous strategies.
- The Noongar Boodjar plant and animal digital encyclopaedia which links Indigenous species names with western scientific (both Latin and Common) names, as well as ancestral ecological and cultural knowledge chosen to be shared by local communities across more than 90 plant and animal species in the Noongar Nation in south-west Western Australia This is hosted on our Atlas of Living Australia. Read about the encyclopaedia on page 23.

Throughout the year, we have continued to work with ranger groups across the country to enhance the resilience and sustainability of our environments. Partnerships such as the work we are doing with the Aak Puul Ngangtam Rangers to conduct Kiikal Keeth (Sawfish in the Wik Mungkan language) surveys, offers a glimmer of hope for one of the most endangered groups of species on the planet.

Significant cultural events such as The National Apology Day, National Reconciliation Week, and NAIDOC Week are recognised and our Cultural Capability Learning Framework accounts for the diverse needs of our people to deliver on our Reconciliation Action Plan commitments.

COVID-19 continued to interrupt our community engagement events. However, our people in Cairns and Canberra participated in local NAIDOC Week 2021 celebrations, including hosting a community day stall in Canberra and attending NAIDOC events in Cairns with key stakeholders from James Cook University Nguma-bada campus, The Cairns Institute and key local Indigenous networks.

Building on our relationships in Cairns, we also hosted a community visit and learning on Country day with Yarrabah community leaders and local Indigenous organisations in partnership with our JCU Nguma-bada collaborative partners and the Australian Tropical Herbarium.

In recognition of National Reconciliation Week 2022, we delivered a hybrid model of events (face to face/virtual) that saw 12 CSIRO sites deliver various onsite activities. Virtually, we held 17 workshops, webinars and panel discussions across all Australian states and territories.

In April 2022, our face-to-face cultural learning workshops recommenced and we delivered 2 workshops in Brisbane. At the end of June, 91 per cent of our people had completed the online Aboriginal and Torres Strait Islander cultural awareness learning.

We have continued to support opportunities towards the Australian Government's Indigenous Procurement Policy and spent $3.97 million with Aboriginal and Torres Strait Islander-owned enterprises.

Across our governance, 45 per cent of our Advisory Groups now have Aboriginal and Torres Strait Islander members, an increase of 20 per cent from last year. We also strengthened the governance of the Indigenous Advisory Group and appointed 8 new external Aboriginal and Torres Strait Islander members to the IAG.

We continued our commitment to invest and elevate the Indigenous Science Program to realise a vision of a science landscape in respectful partnership with Indigenous Australia to deliver innovative, sustainable, holistic solutions to meet our greatest national challenges prioritised by Aboriginal and Torres Strait Islander communities.

In March, we launched our third Innovate Reconciliation Action Plan to demonstrate our commitment to investing in and building sustainable relationships with Aboriginal and Torres Strait Islander communities and stakeholders that we work with.

Indigenous employment

We continued our commitment to Aboriginal and Torres Strait Islander Employment by launching a new Indigenous Employment strategy focused on courageous accountability and sustainable employment outcomes. As part of this strategy, we will deliver holistic and adaptive solutions that align to our capabilities as an organisation.

Over the last year, our representation of Aboriginal and Torres Strait Islander employees improved across the organisation. The total number of Aboriginal and Torres Strait Islander staff increased by 21 per cent, and 94 per cent of this increase has been attributed to the recruitment of staff outside the traineeship and cadetship programs. In addition, we have increased our representation of Aboriginal and Torres Strait Islander staff at CSOF 5 and above by 28 per cent and 14 per cent of staff are people managers.

New recruitment measures introduced included identified positions and conscious inclusion practices for Aboriginal and Torres Strait Islander people to provide more opportunities to attract Aboriginal and Torres Strait Islander talent and support us becoming an employer of choice. In addition, we introduced our Acknowledgment of Country statement across all our recruitment material and reviewed our current career registers including our postgraduate studentship register.

A total of $51,000 in funding was provided to 3 Aboriginal and Torres Strait Islander Postgraduate students as part of our Research Plus Top-Up Scholarship program. Additionally, we engaged 10 Aboriginal and Torres Strait Islander people as part of our broader studentship programs over the year. There were 2 vacation students and 6 postgraduate students.

At the end of June, 1.64 per cent of our employees, 0.55 per cent of students and 0.29 per cent of affiliates identified as an Aboriginal and/or Torres Strait Islander person in our system. We recognise there is more work to be done and will continue to invest in creating sustainable careers for and with Aboriginal and Torres Strait Islander people.

Analysis of performance

Our efforts this year contributed to us delivering towards our outcomes as detailed in Table 3.11.

Consolidated analysis of performance

We created a differentiated workplace this year with appropriate investment in our people and their capabilities to enhance our culture, safety environment and wellbeing that underpin our objectives and purpose.

We surveyed 3,590 of our people to explore our culture, engagement and wellbeing.

Table 3.11: Summary of performance for enabling capabilities

FOCUS AREA	METRIC*	TARGET	RESULT
Ensuring staff safety and wellbeing	Staff Survey: staff wellbeing responses	72%	**Not achieved**: 65% – a drop of 3% from 2020–21. The long-term impacts of sustained focus and commitment in an uncertain environment continue to be felt.
	Hazard reporting (number of hazards recorded by staff in the health, safety and environment system)	1,440 reports	**Not achieved**: 771
Enhancing our positive culture	Staff Survey: Sustainable Engagement Score	81%	**Not achieved**: 76% – a drop of 4% from 2020–21. Our people remain strongly supportive of CSIRO but experienced challenges in how they do their work. This is being explored by the Ways of Working program.
	Diversity in leadership: proportion of female leaders (as defined by organisation role)	37%	**Achieved**: 41.1%

*Source: Corporate Plan 2021–22

Our staff are engaged and empowered in their work

Our sustainable engagement score was at 76 per cent, a 4 per cent decline compared to 2021 and was under our target of 81 per cent for the second year in a row. Our people remain strongly supportive of CSIRO but experienced challenges in how they do their work. This is being explored by the Ways of Working program. The energised component has remained fairly consistent over the COVID-19 period. The downward shift is related to the engaged and enabled elements.

Our innovation culture and operations enhance the wellbeing of our staff

Sixty-five per cent of respondents were positive about their wellbeing. This is 3 per cent lower than the results of the previous survey in March 2021 and below our target of 72 per cent. It was noted that there was a reduction in people's perception of their overall health status after the impacts of living with COVID-19 have continued.

Our workforce is inclusive, harnessing the full potential of our people

Our proportion of women in leadership positions increased from 37.6 per cent to 41.1 per cent this year and is ahead of our target levels since 2015–16 when it was only 28.4 per cent. We are also committed to increasing our intersectionality and non-gender diversity.

CSIRO manages security risks and promotes a positive security culture as effective methods to protect our people, information and assets.

Sustainable operations, sites and infrastructure

Outcome

Our key activities include our Security Action Plan, our property strategy and a focus on increasing the agility of our operations. We also progressed actions and initiatives outlined in our Sustainability Strategy 2020–2030 so that we have sustainable operations, sites and infrastructure to support our science and research.

Security

Securing our people, property and systems is paramount to protecting our research. The security environment is evolving quickly in today's global research environment, and we have placed a strong focus on evolving with it to meet increasing challenges.

Acknowledging this evolution, we sought external support to assess our security arrangements and assist us to continue evolving them in a way that will meet government expectations into the future. We engaged consultants to review our security governance arrangements and our integration between security disciplines across CSIRO. We will begin implementing their recommendations in 2022–23.

Our robust security regime identifies and controls for a range of security risks. In 2021–22, our Security Action Plan focused on 4 key priorities: countering foreign interference; cyber security; physical security; and personnel security.

Countering foreign interference

In recent years, the threat of foreign interference in Australian research has risen. We are setting the standard in countering foreign interference in the research sector and have established new ways of protecting our people and our research. This work is being undertaken with universities, other Publicly Funded Research Agencies (PFRAs) and allied agencies overseas.

In 2021–22, we implemented our research sector leading Research Engagement Sensitivities Tool, developed in-house in consultation with government and our science community. It estimates the foreign interference risk of a new project and assists with appropriate decision making. A comprehensive change management program was undertaken to increase awareness of foreign interference and equip our people to protect themselves and CSIRO. This has increased awareness among our researchers to navigate the complex challenges associated with working with overseas partners.

Concurrently, we worked with government partners to assist Home Affairs in reaching out to the research sector, meeting with universities and other PFRA to share our approach and lessons learned. This year, as a sector lead, we met with, or briefed, 40 Australian research sector partners, and some of our international counterparts in collaboration with government partners.

We initiated a new policy for our staff who needed to work from home overseas for compassionate reasons during the pandemic. Robust security assessments and advice ensured this policy did not expose CSIRO – or our people – to unacceptable risk. Recently, our guidance was used to support researchers in the rapid change in expectations due to the Russia-Ukraine conflict. We have limited exposure to Russian collaboration, but where it exists, we supported our researchers to determine how to move forward in consultation with government and our international allies.

Achieving cyber security

This year, we made a significant investment in the Cyber Security Uplift Program to augment cyber security uplift and technical controls in our corporate IT services. The program included embedding a cyber security culture and awareness into the support IT teams and within the organisation.

We are committed to the Australian Government standard for cyber security, ensuring that our key enterprise and high performance (HPC) systems comply with the Australian Cyber Security Centre's (ACSC) Essential Eight (E8) strategies to mitigate cyber security incidents and protect against cyber threats.

To protect against various cyber threats, the E8 uplift this year focused on:

- HPC, Office 365, Dynamics and SAP Platforms to uplift to higher maturity levels (excluding application allow listing)
- Office macro controls
- backups and restore controls.

In response to the shift to the hybrid working environment to limit COVID-19, including increased staff working from home, the remote access technology platform was uplifted to reduce threats. A remote access platform was initiated that ensures that network-based threats are assessed and eliminated before they impact CSIRO systems.

Physical security

In 2021–22, progressing our project to consolidate access controls across our biggest sites delivered convenience for our people, but importantly, now provides a modern and easily auditable system that assists us to address and prevent unauthorised access quickly.

We also focused on improving the advice we can provide to our people, to account for the changing security environment. We recruited a larger team of people with key expertise to provide authoritative guidance on matters such as CCTV procurement, secure premises and visits.

Personnel security

We are contracting an external provider to centrally manage criminal, qualification, sanctions and employment background checks. Criminal checks will be up to 10-year international checks and will specifically bridge identified gaps in relation to foreign nationals. These pre-employment checks will provide greater assurance of the trustworthiness and integrity of our people. We reviewed our security clearance procedures and are implementing improvements to streamline this process.

Property strategy

Sustainable property portfolio

We manage many of Australia's state-of-the-art science facilities and biological collections as well as a portfolio that includes 50 domestic sites, 3 international sites and more than 950 buildings as at 30 June 2022. We also have 29 minor locations where our people access desks or small areas of land. These sites and facilities enable our scientists to solve the greatest challenges through innovative science and technology.

Our 2019–29 Property Strategy provides a framework that articulates investment and divestment principles for decision making to ensure our property portfolio provides fit-for-purpose infrastructure that is efficient, affordable and sustainable. We report our Property Strategy's implementation progress to the CSIRO Board biannually against quantifiable performance targets. We have strong governance arrangements for property divestments and management of our project delivery.

Annual Property Implementation Plans complement the 2019–29 Property Strategy and take account of changes to the focus of our science and unexpected events (bushfires, flooding and COVID-19 impacts) that have changed the way we work.

Property strategy progress this year included:

- Sites closed: Fortitude Valley (Qld), Armidale UNE (NSW), Acton (ACT), Docklands (Vic) and Yarralumla (ACT).
- Staff vacated our Gatton (Qld) site and the majority of our staff exited our North Ryde (NSW) site, enabling savings and efficiencies.
- New sites added: Forest Hill and Herston (Qld) and Westmead (NSW) to offset savings in site divestments. Due to increased co-location with research partners, we have new minor locations including at Macquarie University and the University of Adelaide.
- Consolidation of our Melbourne sites, and staff relocation from Parkville, Docklands, and Blackburn Road to Clayton is progressing. The first stage of our Perth sites consolidation, in line with our sustainability goals to provide more efficient and fit-for-purpose facilities, will be completed by the end of 2022.
- Construction commenced of a new national collections facility to house the Australian National Wildlife Collection, the Australian National Insect Collection, the Ethanol Collection and the Dadswell Wood Collection at our Black Mountain site. The facility, including cryogenics and molecular and digitisation labs, is supported by National Collaborative Research Infrastructure Strategy (NCRIS) funding. Read more about our national collections on pages 46–62.
- Divestment of Ginninderra (ACT) and Belmont (Vic) is progressing.
- Part-life refurbishment of the Australian Centre for Disease Preparedness at Geelong (Vic) is on track for a 2028 completion and is within budget.

We are working with the Western Parkland City Authority as an anchor tenant at Aerotropolis Bradfield in Western Sydney. The majority of our Sydney operations will relocate there in 2026–27, which will enable the possible future divestment of our Marsfield and Lindfield sites.

Work to ensure our offices remain vibrant, safe and sustainable is a priority as staff return to sites or continue hybrid work from home arrangements.

Managing our heritage

We recognise our responsibility to conserve the Commonwealth and national heritage values of the places we own or control, and we manage these values under the *Environment Protection and Biodiversity Conservation Act 1999*. Our Heritage Strategy for CSIRO Land and Buildings 2016–26 has been endorsed by the Australian Heritage Commission.

In 2022, we will provide the Department of Agriculture, Water and the Environment with an update, including advice on all completed Heritage Assessment Reports and Heritage Management Plans, expenditure on heritage-listed facilities, and other items of note. For example, due to the hailstorm damage at Black Mountain in 2020, we had to replace heritage skylights in Building 101 – Foundation Building. The motifs on the front of the building were designed to represent the 2 research divisions occupying the building: wheat sheaf for Plant Industry and a scarab beetle for Entomology.

All Heritage Management Plans and information on other Commonwealth heritage-listed sites are available at csiro.au/Heritage.

Sustainability

During 2021–22 we redefined our approach to sustainability, aiming to drive positive performance and change, within and outside our organisation. We aim to be an exemplar of sustainable culture and practice, suiting a world-class research organisation with sustainability at its core. We are tackling climate change through our research and our commitment to achieve net zero emissions for our organisation by 2030, and beyond to our value chain by 2050.

Major achievements/actions this year under our Sustainability Strategy included:

- a review of our sustainable procurement practices
- our first enterprise climate risk assessment using our Climate Compass methodology
- commenced development of a carbon offsetting strategy and prioritisation of existing and emerging CSIRO technologies that can be deployed within CSIRO to help achieve our Net Zero Emission targets.

We are trialling updated Ecological Sustainable Design processes on several new building projects and have launched a ‘Green Caffeen’ campaign to reduce use of disposal paper coffee cups across several of our cafeterias. See our Sustainability Report for 2021–22 on our website.

Our sustainability performance

Section 516A of the *Environmental Protection and Biodiversity Conservation Act 1999* requires that we report annually on how we accord with and contribute to ecologically sustainable development (ESD) including our environmental performance covering the impact our activities have on the natural environment, how these are mitigated and how they will be further mitigated.

Sustainability is at the core of our purpose. Our science and research delivers national benefit, providing solutions that enhance our quality of life, stimulate our economy and preserve our unique environment.

With over 5,600 staff working at 53 sites in Australia and overseas, we have a substantial environmental footprint. We are minimising the environmental impacts of our operations through application of ESD principles, proactive environmental risk management and controls.

Reducing our carbon emissions

Our grid-fed electricity use was similar to 2020–21 as we continue to implement initiatives that will impact our future electricity consumption, such as our Property Strategy, increased battery storage at our Boorowa site and commissioning of PV systems at our WA sites. We continue investigating opportunities to deploy more on-site renewable energy across our portfolio. However, our gas consumption increased slightly during 2021–22, resulting in an increase in our Scope 1 emissions. We have a long-term plan to reduce our Scope 1 emissions through mechanisms such as electrification of our gas-based building systems where possible and investigation of alternatives for our transportation fuels.

Managing our waste

We continued our efforts to manage our onsite waste streams and improve our diversion from landfill. The findings from a targeted waste audit program late in the 2021 financial year are being considered, including engagement with key stakeholders on the audit recommendations. Development of a new waste strategy to achieve the 80 per cent diversion target under the Sustainability Strategy is slightly behind schedule and will be implemented in 2023.

In 2021–22, our waste diversion rate was improved slightly compared to the previous reporting period, increasing by approximately 6 per cent.

Water

We have commenced a targeted water audit program at our Black Mountain site in Canberra to improve our understanding of water consumption patterns across the site and inform the development of a long-term water management strategy for both the site and broader CSIRO. Our water consumption has decreased by approximately 7 per cent for the 2022 financial year, compared to the previous year, which is largely attributable to partial relocation of staff from specific sites such as North Ryde, as well as the continued impacts of hybrid working arrangements and general reductions in water consumption across multiple sites.

Air travel

Our air travel footprint for 2021–22 has remained well below our pre-COVID-91 levels despite domestic and international borders opening up from the COVID-19 pandemic. Domestic travel dominates the 2022 financial year air travel footprint, with staff flights within Australia accounting for 77 per cent of air travel emissions. Normalcy of online meetings and potential travel hesitancy are likely to be the reasons for the lower than expected air travel figures.

Corporate Affairs Strategy

Our Corporate Affairs team support CSIRO to deliver on its purpose through communications with our people, government engagement, business outreach, digital and social media channels, media relationships, and events that engage, inform and inspire stakeholders across government, industry, research and the general public.

This year, Corporate Affairs activities contributed to an increase in our Business Sentiment Survey results, with awareness about ways of working with CSIRO lifting from 35 per cent last year to 44 per cent this year, and steady levels of trust in the wider community in our Community Sentiment Survey, which delivered CSIRO a total trust score of 86 per cent. These results are discussed further on pages 54–55.

As Australia faced the ongoing pandemic, record-setting floods, a mouse plague and unprecedented energy market disruption, our experts explained the science and our work on solutions in media interviews, social media engagement, government briefings and internal staff updates. Our #ilovescience social media campaign encouraged vaccine advocacy throughout the year. At the United Nations' Climate Change Conference (COP26), our energy research engaged 11,000 people who attended the Australian pavilion and 310,000 people across our digital and social channels.

Our research delivers real-world impact through partnerships, including our Missions program. Our Future Protein, Trusted Agrifood Exports and Drought Resilience missions launch reached 2.2 million Australians through media and social coverage. Media coverage of our Ending Plastic Waste mission launch reached 11.4 million Australians, with additional international coverage through Fox, NBC and CBS news affiliates, and followed by the Plastics Innovation Hub in Indonesia launch event with 220 participants.

We worked with James Cook University, Room 11 architects and Suncorp insurance to run the 'One House' campaign to increase awareness of how to build disaster resilience in our houses, drawing particularly on our bushfire expertise, reaching 8 million Australians through marketing, advertising and a documentary. We also partnered with Google to promote our work with them on the Great Barrier Reef at their annual I/O event, including reaching 10 million people through their livestream of the event and our work featuring on the Google Search and Youtube homepages – 2 of the most visited websites in Australia.

Corporate Affairs supports CSIRO being an employer of choice through marching at the Sydney Gay and Lesbian Mardi Gras, this year with an energy theme (discussed further on page 103) and the Impossible without You campaign (discussed further on page 116), recruiting people for 250 newly-created roles through advertising, media and social media activity.

Finance

Significant progress has been made in the management of our assets and prioritisation of the 4-year capital budget, with the implementation of an ET sub-committee focused on a revised capital allocation process and the release of capital bid templates in early April. There are constraints within the capital budget, and further work is planned as part of the long-term action plan developed through the asset management review. We will continue to develop and adapt our strategic capital management plan for the future.

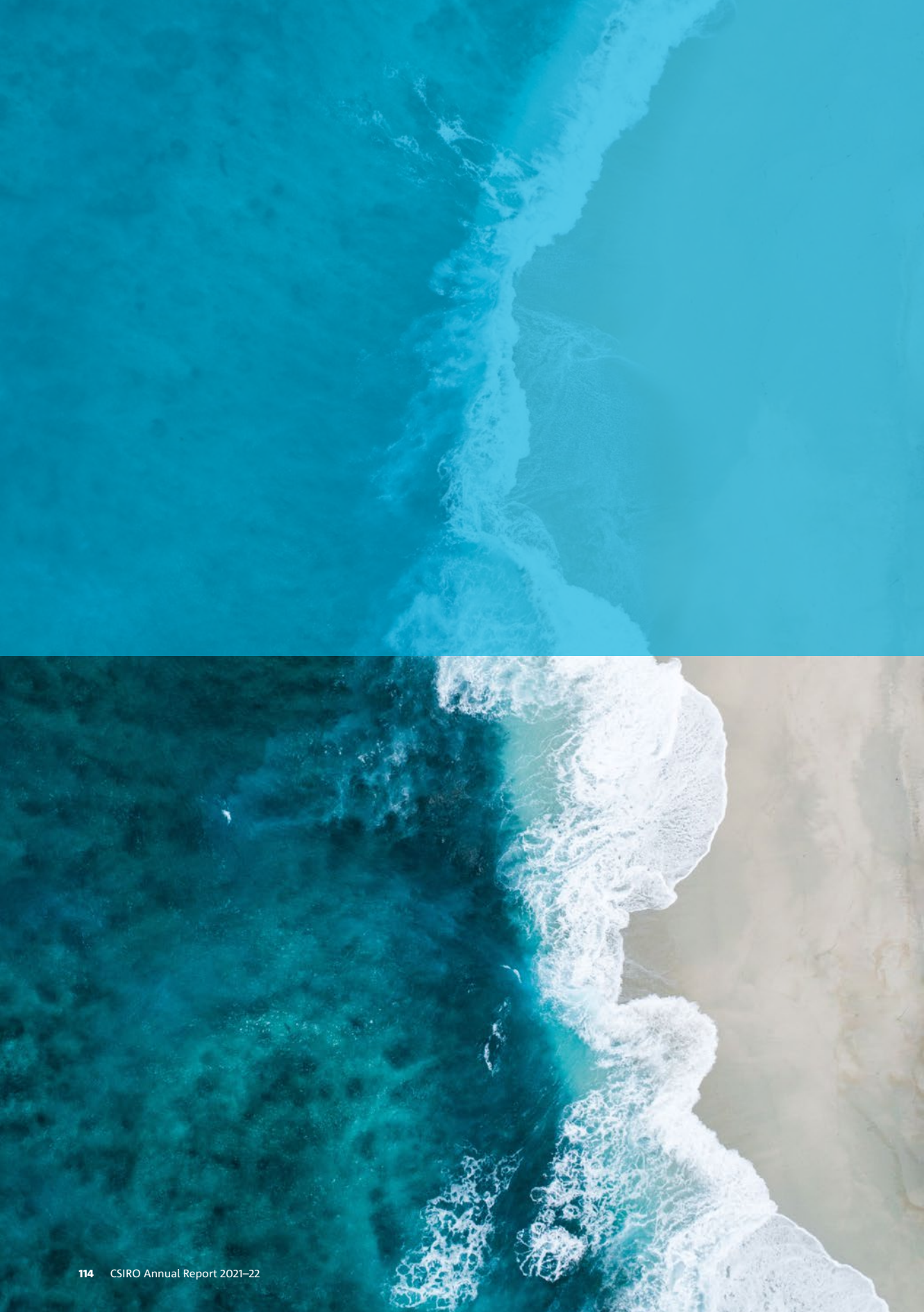
Analysis of performance

We continued to improve our efficiency and sustainability to ensure we maintain our capacity to innovate for Australia. Our enabling capabilities contribute to our people's efficiency and effectiveness.

In 2021–22, our Security Action Plan focused on: countering foreign interference, cyber security; physical security, and personnel security. We are implementing increased security measures to protect our information, people and assets. Our 2019–29 Property Strategy aims to provide efficient, affordable and sustainable infrastructure to better enable our people. Actions under the Strategy this year included consolidating sites and commencing initiatives to provide smarter national laboratories.

We continued to implement our organisational-wide Sustainability Strategy, including developing a carbon offset strategy and commitment to achieve new zero emissions by 2030. Our efforts to improve our environmental performance include using renewable energy on our sites. Our Sustainability Strategy supports us to recognise and manage our impact.

Measures that increased the agility of our operations included encouraging our workforce to further develop their digital skills and incorporating innovative practices into our work capabilities.



Part 4
Our organisation

Our people

The complex problems we solve require highly capable people and an effective organisation staffed by world-class dynamic teams. Our people, operations, management and governance all contribute to our delivery of key activities specified in our Corporate Plan.

Our extraordinary people are our most important asset and are critical to our success.

Our scientists, researchers and engineers are internationally renowned experts in their fields and are trusted advisors in academia and to industry and government. They work across the entire science, technology, engineering, mathematics and innovation spectrum. Our researchers are supported by a variety of professional staff skilled in research, laboratory services, data collection and data management. Technical and corporate support staff deliver commercial services, intellectual property portfolio management, engineering services, field operations, information technology, information services, communications and financial, human resources, supply, facilities and general management services.

We are proud of the achievements of our people. Their recognitions are too many to list but we cite a selection, including CSIRO Awards, on pages 14–17. As a values-driven organisation, we put our people first and recognise people's broad attainments including behaviours which align with our values. Read more about our values on pages 13 and 101.

Our diverse workforce of people come from more than 140 countries, with around a quarter from non-English speaking backgrounds. We range from staff, trainees and apprentices aged 15 years to emeritus researchers and office staff aged over 80 years. This diversity of minds and lived experiences breeds innovation and is critical to overcoming the challenges we need to tackle.

We aim to attract the best people and develop and engage them in an inclusive and supportive environment and have been successful in doing so, with a year of considerable growth in our organisation. We are taking this growth to the next level in 2022–23 with our 'Impossible without you' recruitment campaign expanding our team for the future. We're looking for the next generation of inventors, innovators and change makers to join Team CSIRO, recruiting early and mid-career researchers to help us make the impossible possible.

This means we will welcome more people to share in varied careers this year who will join our diverse team already working in roles, including laboratory technicians, research scientists, engineers, immunology specialists, astronomers, data science analysts, wine growers, deep sea divers, social psychologists, accountants, economists and media specialists.

With our flexible working options, many of our people also contribute to their local communities, including as volunteers for local State Emergency Service, Red Cross and various community groups and as Justices of the Peace. Our people also contribute in scientific advisory and consultative roles as radiation safety officers and through participation in activities such as STEM in Schools to inspire the next generation of researchers.

We also engage consultancy services when necessary. Read more about our consultancy services on page 136–137.

Our people in numbers

At 30 June 2022, we employed 5,672 people. This is a considerable increase of 8.6 per cent from the previous year.

The majority of our people – some 61 per cent – are classified within the research function, down 1 per cent from last year. CSIRO manages our workforce strategically in order to deliver against our science strategies and undertake the complex range of activities that we do as the national science agency.

This has meant that this year, in a year of high growth, it was the cohort of people supporting our researchers who grew the most – growing by 11 per cent, with the researcher cohort growing by 7 per cent. This shift in our workforce composition aims to reduce the load on our researchers now and will support the new wave of researchers being recruited this year to help solve Australia's greatest challenges.

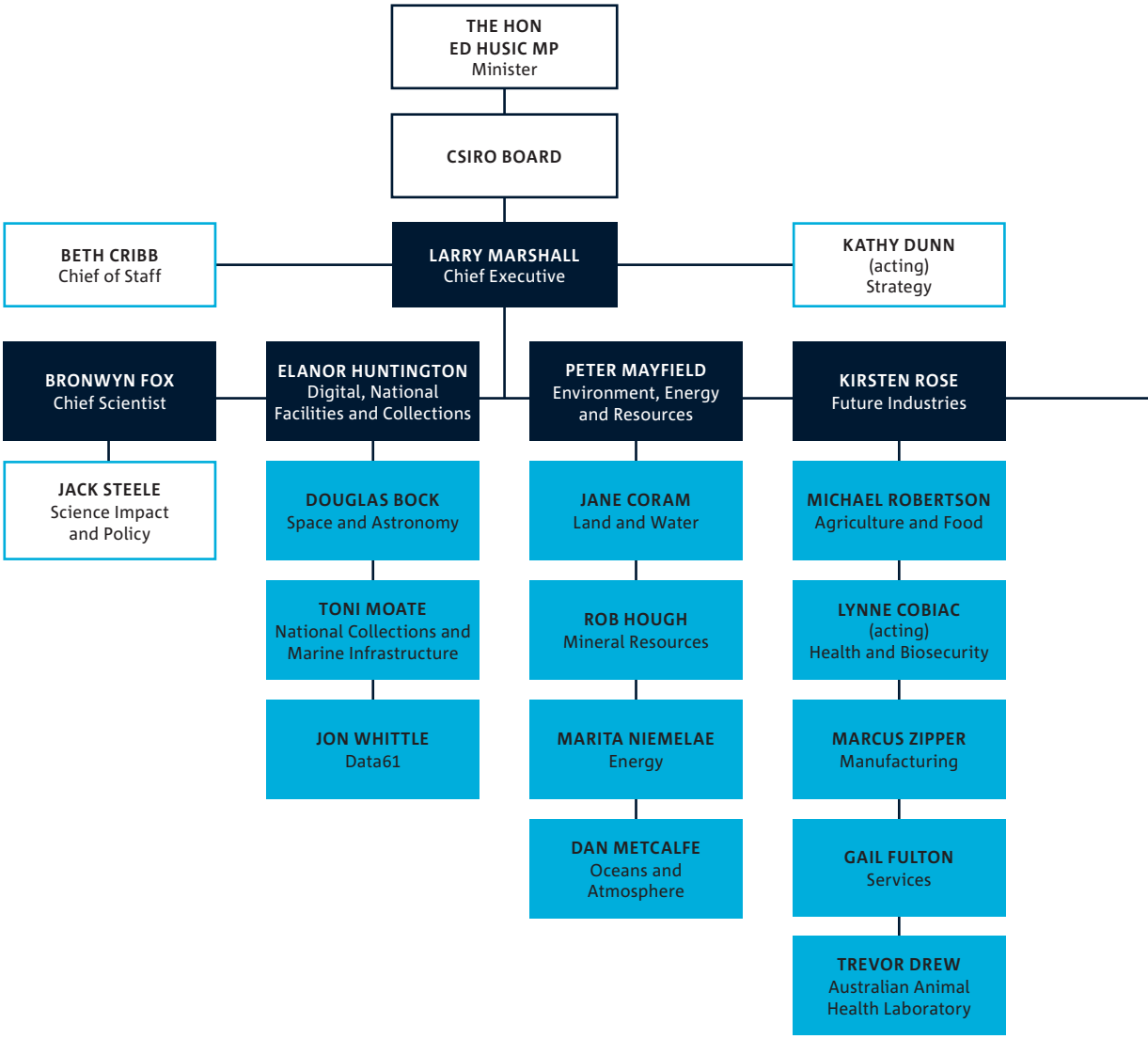
Our science could also not be progressed without collaborations across the national innovation system involving an additional 2,445 affiliates, including fellows, distinguished visitors, students, contractors and other collaborators. Read more about our 'Impossible without you' campaign on page 116.

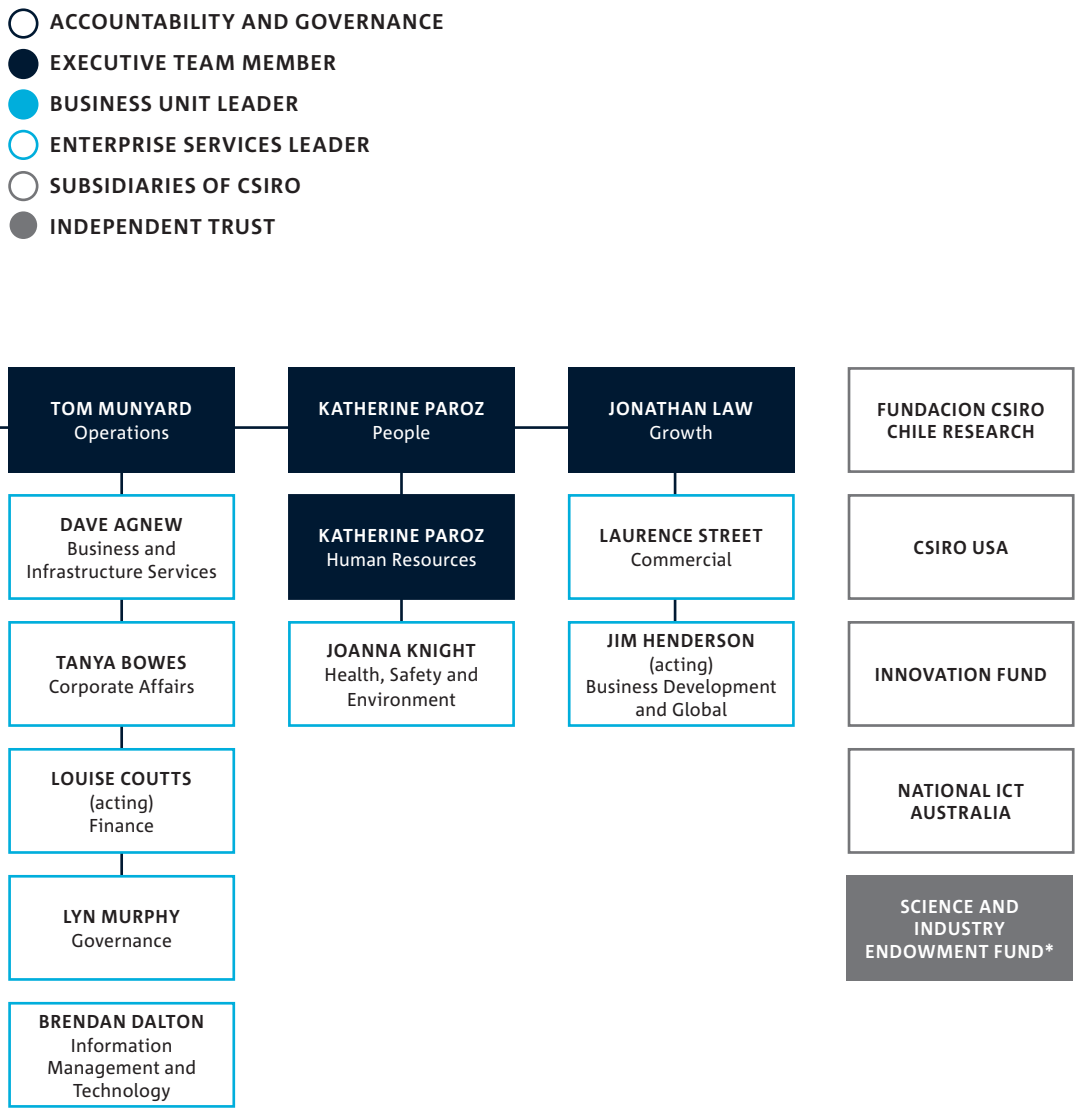
Table 4.1: Staff numbers (headcount) by functional area

FUNCTIONAL AREA	2017–18	% FEMALE 2017–18	2018–19	% FEMALE 2018–19	2019–20	% FEMALE 2019–20	2020–21	% FEMALE 2020–21	2021–22	% FEMALE 2021–22
Research										
Research scientists/ engineers	1,533	27	1,570	28	1,485	28	1,424	29	1,514	31
Research project staff	1,809	42	1,829	42	1,521	41	1,504	42	1,625	42
Research management	251	22	233	21	250	24	252	29	257	32
Research consulting	55	26	53	25	60	28	57	21	68	34
Non-research										
Senior specialists	19	42	17	47	13	46	11	55	10	60
Technical services	672	17	719	17	683	16	665	17	707	18
Communication and information services	260	78	281	80	230	80	206	81	256	85
General services	19	53	16	50	8	38	8	63	15	60
Administrative services	999	75	1,046	75	930	75	946	74	1,071	74
General management	150	45	151	50	139	52	148	51	149	52
Total headcount	5,767	41	5,915	42	5,319	41	5,221	42	5,672	44
Full-time equivalent (FTE)	5,190	39	5,359	40	5,065	40	4,949	40	5,291	42

Our organisational structure

(as at 30 June 2022)



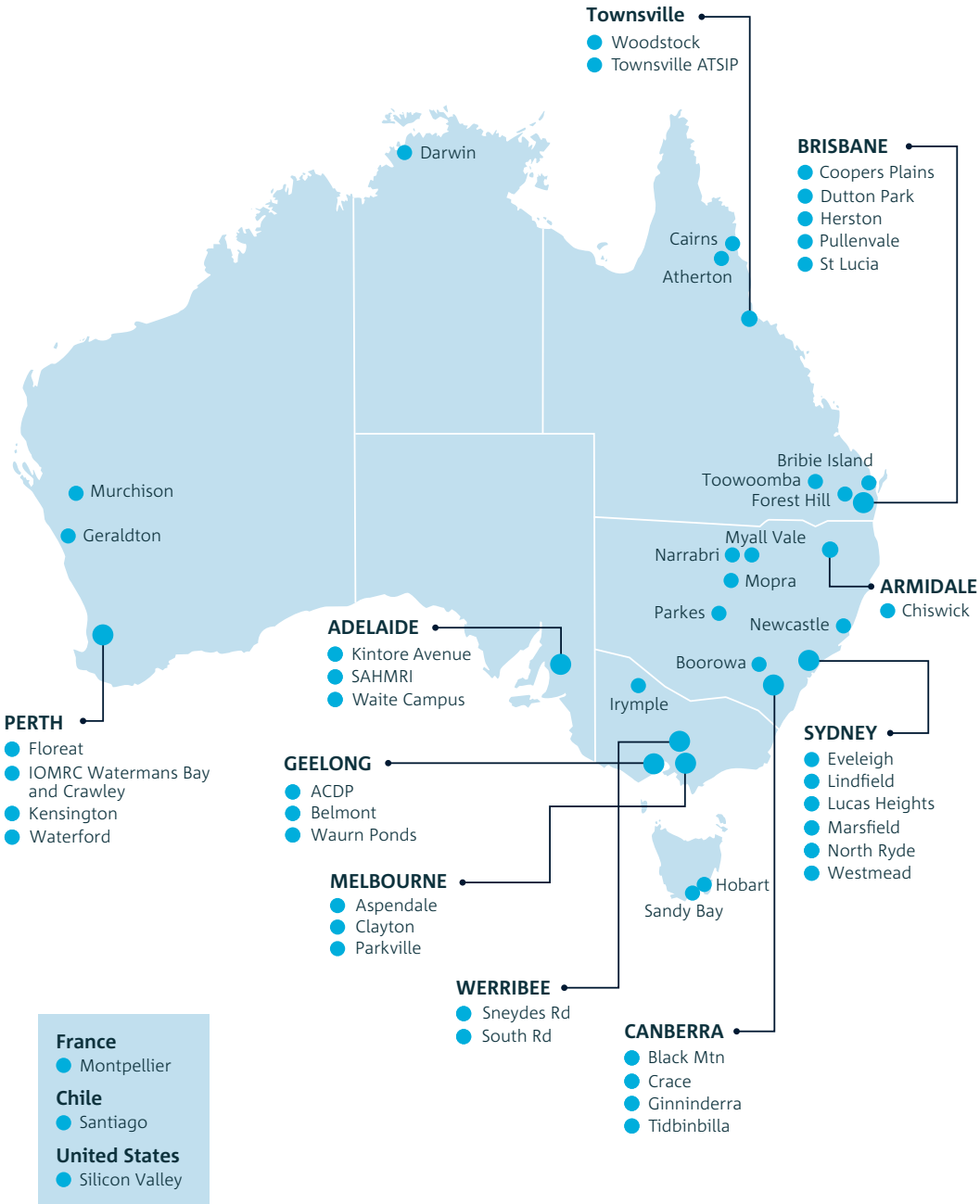


*Read about our subsidiaries in Note 3.4 of the Financial statements in Part 5.

Our sites

At 30 June 2022, we operated 50 sites across Australia and 3 sites overseas.

Our people also access desks or small areas of land for research purposes in 29 minor locations.



As Australia's national science agency, we have people, facilities and activities in all states and territories. Here are some examples.

Westmead patients to benefit from growing research hub

Researchers working on clinical trials, diagnostics for early disease detection and prevention, virtual care models of chronic disease and aged care, health system analytics and bioinformatics, and using Artificial Intelligence for health have moved to the Westmead Research Hub as part of our first site to be co-located with NSW Health.

The researchers will build on a number of projects already under way, including using:

- Artificial Intelligence (AI) to predict adverse outcomes in preterm babies, working with Western Sydney Local Health District, University of Sydney, Sydney Children's Hospital Network and the Cerebral Palsy Alliance
- Bioinformatics (harnessing big data) to enhance gene therapy treatments for children with serious conditions, working with the Children's Medical Research Institute
- Bioinformatics to support activity in 'phage' therapy, which could create an alternative to antibiotics to treat bacterial infections and fight antimicrobial resistance, working with partners across the precinct. Phage therapy, also called bacteriophage therapy, uses viruses to treat bacterial infections.

The move is part of the Sydney Consolidation Project, bringing teams closer together at vibrant, collaborative sites.

Westmead research hub is where CSIRO will be co located, and Nathan Moore from Western Sydney's Local Health District demonstrates a VR training program for medical staff.

The Pyrotron in action at the National Bushfire Behaviour Research Laboratory at CSIRO Black Mountain, Canberra. The Facility opened in March 2022.

New national lab bolsters bushfire response

In the face of more extreme events, in March we unveiled our new world-class bushfire research facility to better understand how bushfires behave, what conditions make them worse and the best ways to respond. Constructed at a cost of $2.1 million, the new National Bushfire Behaviour Research Laboratory is located at our Black Mountain site in Canberra.

The new laboratory will boost the power of our Pyrotron and Vertical Wind Tunnel (VWT) – 2 unique instruments designed to allow the detailed investigation of the physics of bushfires. Read more about these on page 29.

The Pyrotron and VWT allow us to:

- gain a better understanding of the physical processes involved in the behaviour and spread of bushfires under a range of conditions
- use a range of scientific instrumentation to quantify specific physical attributes of the behaviour and spread of fires and firebrands, including IR thermography, turbulence and thermal characteristics
- explore the effects of a broad range of weather and fuel conditions on flame propagation, including those associated with extreme wildfires
- develop better models of the influence of key parameters such as fuel moisture, wind speed and ignition configuration on fire behaviour to improve effectiveness and safety of firefighting
- improve the design and execution of large-scale field experiments, particularly of specific instrumentation used for such experiments
- develop a better understanding of likely emissions from bushfires in different fuel and burning conditions.

The bushfire lab, a CSIRO-owned national facility, is available for use by arrangement by any external organisations to better understand fire behaviour and their impacts.

Drill core research facility to support Australian mineral discovery

The Geoscience Drill Core Research Laboratory, a state-of-the-art research facility, opened in October at the Advanced Resources Research Centre in Perth. The $7 million lab, the only facility of its kind in Australia, brings together a suite of advanced mineral characterisation equipment, including our unique Maia Mapper, specialised for drill core analysis and research.

The lab's combination of advanced Mining, Equipment, Technology and Services instrumentation alongside our existing advanced characterisation facilities gives researchers and industry the opportunity to study drill core samples at multiple scales. Extracting more data from drill core analyses will help unlock Australian critical minerals by providing information that drives key decisions for the discovery, mining and processing of resources.

The facility will also provide a new training ground for students, supporting development of the next generation of geoscientists to become innovators for the resources sector.

The Geoscience Drill Core Research Laboratory and Maia Mapper were funded by CSIRO and the Science and Industry Endowment Fund (SIEF), with co-investment from the University of Western Australia and Curtin University.

The Geoscience Drill Core Research Laboratory is the only facility of its kind in Australia.

The only one of its kind in Australia, our Geoscience Drill Core Research Laboratory brings together a suite of advanced mineral characterisation equipment, including CSIRO's unique Maia Mapper, specialised for drill core analysis and research.

Management and accountability

Government engagement

In 2021–22, our people held regular meetings with ministers, parliamentarians and senior staff from relevant government departments to discuss their needs, share research activities and provide scientific information. Our advice also informs policy development and program implementation and evaluation.

We made 2 submissions to parliamentary inquiries and our people provided information at 3 inquiry hearings. Inquiry topics included Australian manufacturing, oil and gas exploration in the Beetaloo Basin, and definitions of meat and other animal products.

Legislation and government policy

We are a Corporate Commonwealth entity constituted and operating under the provisions of the *Science and Industry Research Act 1949* (SIR Act).

Our primary functions are to carry out scientific research to:

- assist Australian industry and to further the interests of the Australian community
- contribute to national and international objectives and responsibilities of the Commonwealth
- encourage or facilitate the application and use of the results of CSIRO scientific research.

Our secondary functions include international scientific liaison, training of research workers, publishing research results, making available scientific facilities, technology transfer of other research, providing scientific services, and disseminating information about science and technology.

Reporting, accountability and other rules for our operations are set out in the *Public Governance, Performance and Accountability Act 2013* (PGPA Act).

Pursuant to section 19 (1) (e) of the PGPA Act, we have had no instances of significant non-compliance with finance law in 2021–22.

We also provide administrative support services to the Trustee of the Science and Industry Endowment Fund (SIEF) consistent with the *Science and Industry Endowment Act 1926*. SIEF has its own governance structure. Read more about SIEF in Part 6.

There were no government policy orders to CSIRO during 2021–22.

Responsible Minister

As at 30 June 2022, the responsible Minister for CSIRO was the Hon Ed Husic MP, Minister for Industry and Science.

From 1 July to 19 September 2021, the Hon Christian Porter MP was the Minister for Industry, Science and Technology. From 19 September to 8 October 2021, the Hon Angus Taylor MP was the Acting Minister for Industry, Science and Technology and from 8 October 2021 to 23 May 2022, the Hon Melissa Price MP was the Minister for Science and Technology. From 23 May to 31 May 2022, the Hon Richard Marles MP, Minister for Employment, was the interim Minister for CSIRO.

Under the SIR Act, the Minister has power to:

- expand the purposes for which CSIRO carries out its scientific research
- provide to the CSIRO Board, in writing, directions and guidelines with respect to the performance of the functions, or the exercise of the powers, of the Board or of CSIRO (SIR Act, section 13(1)).

Ministerial directions and notifications

Under the SIR Act and the PGPA Act, CSIRO's responsible Minister and the Finance Minister may provide the CSIRO Board with Directions with respect to the performance of the functions, or the exercise of the powers of the Board or the organisation. No such Ministerial Directions were received in 2021–22. During 2021–22, we kept our responsible Minister and the Minister for Finance informed of our activities through our Board and in accordance with section 19(1)(a) of the PGPA Act.

Governance

The CSIRO Board is responsible under the SIR Act and the PGPA Act for the overall strategy, governance and performance of our organisation. Section 12 of the SIR Act sets out the functions of the Board. The Board Charter and other details are available on our website.

The Board comprises 9 part-time, non-executive members including the Chairman, and a fulltime Chief Executive. At 30 June 2022, there was one vacancy on the Board. All non-executive Board members are appointed by the Governor-General. The Chief Executive is appointed by the CSIRO Board, in consultation with the Minister pursuant to s10B of the SIR Act.

In 2021–22, our Board operated in part through 3 standing committees:

- The Audit and Risk Committee assists the Board in fulfilling its corporate governance responsibilities regarding financial reporting, audit and risk oversight, reporting obligations, and internal controls and compliance with relevant laws and policies.
- The People and Safety Committee assists the Board to meet its governance responsibilities relating to people, health and safety strategies, obligations, performance and culture.
- The Science Excellence Committee assists the Board to fulfil its governance responsibilities regarding science, capability and strategic plans to ensure CSIRO maintains its reputation for scientific excellence and capacity to respond to national challenges and opportunities.

In accordance with section 17 of the PGPA Rule, all members of the Audit and Risk Committee are not employees of CSIRO. The functions of the Audit and Risk Committee are set out in the Committee's charter available on our website: csiro.au/en/About/Leadership-governance/Minister-and-Board/BARC. Members are selected based on their expertise and ability to discharge the Committee's functions in line with the charter. Read more about the Committee members and meeting attendance at Appendix C and Appendix D.

Board members are appointed for their expertise and provide an extensive range of skills, knowledge and experience to assist CSIRO to deliver on its core mission and deliver science impact for Australia. On appointment, Board members are formally inducted in the organisation's functions, operations and activities and their duties and responsibilities as a member of the Board of a Corporate Commonwealth entity. Board members are provided with a comprehensive set of documents including the PGPA Act, SIR Act, Corporate Plan, Risk Management Framework and key plans and policies.

Members maintain their professional development and participate in CSIRO site visits, as well as governance and business briefings, and they engage with staff and external stakeholders. Members may seek independent professional advice and liaise with CSIRO senior management in keeping with their duties, responsibilities and obligations as Board members.

Under its Charter and Operating Guidelines, the CSIRO Board examines its performance, composition and skill base regularly to ensure it is operating efficiently, effectively and following the principles of good corporate governance. Board performance is usually reviewed at least every 18 months, with the most recent being a self-assessment in February 2022.

The Board holds 6 formally scheduled meetings and a strategy session each year, with additional meetings held as required. In 2021–22, 8 Board meetings were held. Members of the Executive and subject matter experts attend Board meetings as required to report on matters related to their areas of responsibility and expertise. The Secretary of the Department of Industry, Science, Energy and Resources, attends scheduled Board meetings at the invitation of the Chair as an observer. Details of remuneration are reported in Note 3.3 of the Financial statements in Part 5. Details of Board meeting attendance are in Appendix D.

Board membership

Ms Kathryn Fagg AO

Dr Larry Marshall

Mr David Knox

Dr Michele Allan

Mr Drew Clarke AO

Prof Edwina Cornish AO

Hon Ian Macfarlane

Prof Tanya Monro AC

Prof Michelle Simmons AO

Dr Peter Riddles AM

Ms Kathryn Fagg AO – Chair (non-executive)
BE (Hons) Chem Eng and MCom (Hons) FTSE GAICD
(2 August 2018 to 13 October 2026)

Ms Fagg, an experienced company director and chair, senior executive and former engineer, was appointed Chair of CSIRO Board from 14 October 2021 for a 5-year term. Her current positions include non-executive Director of the National Australia Bank Ltd, Medibank Private Ltd and Djerriwarrh Investments Ltd, Chair of Breast Cancer Network Australia, Inaugural Chair of Watertrust Australia Ltd, as well as a Board Member of the Grattan Institute, The Myer Foundation and the Champions of Change Coalition.

Dr Larry Marshall – Chief Executive BSc (Hons) PhD FAIP FTSE FAICD (1 January 2015 to 30 June 2023)

Dr Marshall is a scientist, technology innovator and business leader with over 25 years' experience in creating value and impact with science. He founded 6 successful companies in biotechnology, photonics, telecommunications and semiconductors in the United States, and has served on 20 boards of high-tech companies operating in the United States, Australia and China. He is a Fellow of the Australian Institute of Physics, the Australian Academy of Technology and Engineering, and the Australian Institute of Company Directors; and ex-officio member of the National Science and Technology Council.

Mr David Knox – Deputy Chair (non-executive)
BSc (Hons) Mech Eng MBA FIE Aust FTSE GAICD
(5 May 2016 to 13 October 2025)

Mr Knox is an experienced company director and executive with a background in oil and gas. His other positions include Chair of Snowy Hydro and Chair of The Australian Centre for Social Innovation and Micro X; a Director of Migration Council Australia, the Adelaide Festival Board and Redflow; and a member of the Royal Institution of Australia Council.

Dr Michele Allan – Member (non-executive)
BAppSc MMgtTec MCommLaw DBA FAICD
(5 May 2016 to 4 May 2024)

Dr Allan is an experienced company director and board chair with significant skills and competencies in the university, private and public sectors and expertise in food and advanced manufacturing. She is the Chancellor of Charles Sturt University and Chair of the boards of Wine Australia, Food and Agribusiness Growth Centre and Defence CRC for Trusted Autonomous Systems. Dr Allan's current board positions include Smart Sat CRC,Food Agility CRC, MJ Chickens and Dairy Food Safety Victoria. She is also Chair of Advisory Council for Australian AgrFood Data Exchange and a member of the Steering Committee.

Mr Drew Clarke AO – Member (non-executive)
PSM BAppSc (Surveying) MSc GAICD FTSE
(24 August 2017 to 23 August 2022)

Mr Clarke is an experienced public sector company director with extensive public policy experience from over 20 years in senior government. He was Secretary of the Department of Resources, Energy and Tourism, and Secretary of the Department of Communications. He is Chair of Australian Energy Market Operator Ltd, a Director of NBNCo, a member of the Australian Government's Low Emission Technology Investment Advisory Council and an *ex officio* member of the Australian Antarctic Science Council. He also chairs advisory groups relating to energy transition research and Antarctic science research.

Professor Edwina Cornish AO – Member
(non-executive) BSc (Hons) PhD FTSE AICD
(26 November 2015 to 25 November 2023)

Professor Cornish is an experienced director with significant scientific and academic leadership and international business development expertise. She played a key role in building one of Australia's first biotechnology companies, Florigene Limited, which developed and successfully commercialised the world's first genetically modified flowers. She is a member of the Council of La Trobe University, a Director of Uniquest Pty Ltd, Ambassador of the Australian Sleep Foundation, and was previously Provost and Senior Vice-President of Monash University.

Hon Ian Macfarlane – Member (non-executive)
FAICD (14 October 2021 to 13 October 2024)

Mr Macfarlane is the Chief Executive of the Queensland Resources Council, a non-executive director of Woodside Petroleum and Chairman of the Innovative Manufacturing Co-operative Research Centre. He brings significant experience in public policy and deep understanding of the resources and energy, agribusiness, science and innovation, skills and training, and industry and manufacturing sectors.

Professor Tanya Monro AC – Member
(non-executive) BSc (Hons) PhD FAA FTSE FOSA FAIP GAICD (25 February 2016 to 24 February 2024)

Professor Monro is the Chief Defence Scientist. Her experience at senior levels in industry and educational institutions includes research in photonics focusing on sensing, lasers and new classes of optical fibres. Professor Monro is Science Patron of the National Youth Science Forum and a member of the South Australian Premier's Economic Advisory Council.

Professor Michelle Simmons AO – Member
(non-executive) BSc Physics (Hons) BSc Chemistry (Hons) PhD FRS FAA FAAAS FTSE FInstP Dist FRNS
(17 September 2020 to 16 September 2025)

Professor Simmons is Director of the Centre of Excellence for Quantum Computation and Communication Technology at the University of New South Wales and Founder and Director of Silicon Quantum Computing. She pioneered new technologies to build electronic devices in silicon at the atomic scale. Professor Simmons, a Fellow of the Royal Society of London, has been recognised by the American Computer Museum as a pioneer in quantum computing and was awarded the US Feynman Prize in Nanotechnology. She is a member of the University Research Commercialisation Scheme Taskforce and National Intelligence Scientific Advisory Board.

Dr Peter Riddles AM – Member (non-executive)
BSc (Hons) PhD Grad Dip Bus FAICD FRSA
(24 April 2014 to 23 April 2022)

Dr Riddles is an experienced company director and advisor to various international science organisations including in the United States and the United Kingdom. He has worked as a research scientist in molecular biology in the public sector, including CSIRO, on commercialisation and new venture creation and government policy development and strategy. His other roles include member of the Science and Industry Endowment Fund GIFT.

Mr David Thodey AO – Chair (non-executive)
BA FAICD (15 Oct 2015 to 14 Oct 2021)

Mr Thodey is a business leader and company director focused on innovation, technology and digital, with over 30 years' experience, including as Chief Executive Officer (CEO) of Telstra and CEO of IBM Australia and New Zealand. His current positions include director of Ramsay Health Care and Chair of Tyro and Xero Limited. He was the Chair of the CSIRO Board until 14 October 2021.

Read more about the accountable authority members at Appendix B.

Read more about board members on our website.

CSIRO Executive Management

Larry Marshall
Chief Executive

Bronwyn Fox
Chief Scientist

Elanor Huntington
Digital, National Facilities and Collections

Peter Mayfield
Environment, Energy and Resources

Kirsten Rose
Future Industries

Tom Munyard
Operations

Katherine Paroz
People

Jonathan Law
Growth

The Chief Executive is accountable for managing the affairs of the organisation according to our strategy, plans and policies approved by the Board as well as the Board Directions to the Chief Executive (section 10A (3) SIR Act).

The Executive Team (ET) supports our Chief Executive. As a team and through their individual roles, ET members lead, direct, coordinate and control our operations and performance in line with the Executive Team Charter. The Charter is available on our website.

ET's responsibilities include development of the Corporate Plan 2022–23, Financial Plan and annual budgets, Annual Audit and Risk Plans, Annual Science Operational Plans and our Organisational Risk Profile. Newly appointed ET members undergo a formal induction process to ensure they are aware of their responsibilities.

ET is assisted by the Major Transaction Committee, the CSIRO Security Committee, the Audit, Risk and Compliance Committee, and CSIRO's Leadership Team.

The **Major Transactions Committee** (MTC) is responsible for managing our involvement in major transactions (as prescribed by the level of risk, type of transaction or value of the transaction over $5 million) and related matters and investment, to ensure the soundness, strategic alignment and potential risk of such transactions. MTC reviews proposed transactions and advises the ET on matters related to proper and efficient performance of business development, intellectual property management and technology transfer activities. During 2021–22, the MTC met on a fortnightly basis with 24 meetings scheduled.

The **CSIRO Security Committee** is responsible for ensuring the effectiveness of our security strategies, programs and measures to protect our people, information and assets. During 2021–22, this committee held 8 meetings. There were no items for approvals in this financial year.

The **Audit, Risk and Compliance Committee** (ARCC) provides objective advice and assistance to the ET in fulfilling its corporate governance responsibilities by overseeing and monitoring the organisation's corporate governance financial reporting, risk and internal control frameworks, its legislative and policy compliance and its internal audit function requirements. ARCC met 6 times in 2021–22.

Our **CSIRO Leadership Team** (CLT) is made up of our senior managers and provides a forum for sharing and discussing issues relating to our management and future strategy.

Advisory mechanisms

Our advisory groups advise our researchers on how we can achieve our long-term strategic objectives and research and development priorities, and how to meet the research, technical and business needs of customers and communities. We are supported by the following 9 groups, with information on membership available at CSIRO Advisory Group Charter – CSIRO:

- Agriculture and Food Advisory Group
- Energy Advisory Group
- Health and Biosecurity Advisory Group
- Manufacturing Advisory Group
- Mineral Resources Advisory Group
- Land and Water Advisory Group
- Oceans and Atmosphere Advisory Group
- Data61 Advisory Board
- Indigenous Strategic Advisory Council

The groups comprise representatives from industry, government, non-government organisations and other stakeholders. This year, they provided advice on the direction of the CSIRO Missions, engagement with industry stakeholders and Business Units' strategies. The Indigenous Strategic Advisory Group endorsed our Reconciliation Action Plan 2021–23, and, in accordance with the Plan will advise on building stronger relationships with Aboriginal and Torres Strait Islander peoples through scientific knowledge sharing, education, employment opportunities and mutually beneficial partnerships.

Modern Slavery Statement

Prior to 31 December 2022, we will be submitting our second Modern Slavery Statement to the Australian Border Force Register to meet our reporting obligations under the *Modern Slavery Act 2018* (Cth). The statement reports on the risks of modern slavery in the operations and supply chains of the organisation and identifies actions to manage, lessen and remove those risks where possible. It is available on our website.

Internal controls

Fraud control

As a Corporate Commonwealth entity, we comply with section 10 of the PGPA Rule by establishing and maintaining an effective fraud control framework. Our Fraud and Corruption Control framework comprises strategies to maintain an organisational foundation to prevent, detect, respond, and report fraud and corruption affecting us. These are complemented by our plans, policies and procedures, systems and internal controls, financial management and assurance activities, and an Enterprise Risk Framework.

We adhere to the Australian Government's Fraud Control Framework 2017's 'Fraud Rule' and endeavour to apply the Fraud Policy and Fraud Guidance in line with best practice. We are committed to nurturing and promoting an anti-fraud culture, which is predicated on preventing, detecting and responding to fraud and corruption affecting our organisation.

Our Fraud and Corruption Control Plan outlines the expectations relating to fraud control foundations, prevention, detection and response, and sets a standard for the effective management of organisational fraud risks.

In 2021–22, a fraud awareness program to uplift fraud awareness and control was rolled out based on the principles of continuous awareness and learning opportunities and was concentrated around International Fraud awareness week and structured stakeholder management engagement. These have contributed to the high completion rate of the Fraud Awareness training modules and increased engagement trends.

We apply an organisational fraud control program involving a cyclic Fraud Risk Assessment and Fraud and Corruption Control Plan updates. The next iteration will be delivered and applied over the 2022–24 period. These controls will be further complemented by a Fraud Pressure Testing program that will provide ongoing support to the organisation through a fraud risk management continual control program.

Our Fraud Control team has established solid engagement with Australian Government departments and agencies including but not limited to the Attorney-General's Department and the Australian Government's Fraud Prevention Centre. This includes participation in newly formed Communities of Practice forums for Fraud Prevention and Fraud Detection, collaborating in fraud control working groups, and supporting like agencies and organisations with learnings, experience and opportunities in relation to science and research fraud control.

Security

We recognise the Australian Government's Protective Security Policy Framework as our guide and use elements from this framework as well as the Australian Government Information Security Manual, to inform our security frameworks. Read more about our risk management in the next section.

Our security community provides a range of awareness training as part of our mandatory eLearning package to arm our people against email phishing, fraud and other security threats. New starters are required to complete these courses within a short timeframe of starting, and the courses are refreshed approximately every 2 years, at which point they are compulsory for the rest of the workforce to complete as well.

We implement agreed management actions on protective security, including improvements on countering foreign interference, and on improving physical security to protect CSIRO people, assets and information. Read more about this work on page 109.

We continue to embed cyber and information security to support our strategy and to demonstrate to our customers that we are a trusted advisor. An ongoing program of cyber security awareness activities including phishing exercises were conducted throughout the financial year. These activities are aligned with the Australian Cyber Security Centre (ACSC) using their Essential 8 mitigation strategies for government agencies.

The CSIRO Security Committee, a sub-committee of our Executive Team, ensures that we implement effective security programs to protect our people, information and assets. It also oversees the development and implementation of security infrastructure improvements.

Identifying and managing our risks and opportunities

The identification and management of risk and opportunities are important to making decisions and solving the greatest challenges through science and technology. While we acknowledge that breakthrough science, innovation and collaboration may carry significant risk of technical or scientific failure, we are committed to managing risks and mitigating their consequences in a considered and effective way. We recognise that, to achieve our purpose, we must take measured and managed risks to ensure our organisation's enabling elements are optimised to best support the achievement of our objectives.

The CSIRO Board determines the nature and extent of the risk it will accept to achieve the organisation's purpose and strategy, consistent with well-organised, ethical and cost-effective use and management of public resources. The Board supports our efforts to identify and manage our risks through 3 standing sub-committees (read more about these committees on page 125):

- Board Audit and Risk Committee
- Board People and Safety Committee
- Board Science Excellence Committee.

Our Organisational Risk Profile is developed through consultations and engagement with organisational leaders across the Executive and Business Units. It involves internal and external environmental scans to considers external, strategic, and internally generated risks with the potential to impact the achievement of our objectives. Key risk activities and the Organisational Risk Profile are reported to the Board Audit and Risk Committee. In 2021–22, this included discussions about risks, review and adoption of the risk framework, and deep dives into Cyber and Biosecurity risks.

In 2021–22, our operational risk work provided the opportunity to review and improve risk management practices and strengthen our risk maturity. This year we:

- identified, monitored and managed risks at a Business Unit level through the Business Unit Strategies and for various key projects, such as Biobank, Child Safe Protection and staff security assessment at our key laboratory and the Square Kilometre Array
- improved risk capability by preparing learning and guidance material for our early researchers and project management teams
- held risk workshops internally to identify and discuss current challenges with risk management for cyber security
- assisted with identifying climate-related risks at an Enterprise level in conjunction with our researchers and scientists and staff. Read more about our risk work at pages 130–131.

Our risk methodology and approach take into consideration both the international standard AS/NZS ISO 31000 Risk Management Principles and Guidelines and the Commonwealth Risk Management Policy.

Our insurance arrangements with Comcover include cover for Directors and Officers Liability, General Liability and Professional Indemnity along with other normally insurable risks. The annual premium attributed to Directors' and Officers' insurance for 2021–22 was $375,237. Our workers' compensation liability is covered through Comcare for which an annual premium is also paid.

Policy Framework

Our Policy Framework comprises policies, principles, procedures and guidance materials to establish our responsibilities and commitments, performance requirements and mandatory actions in conducting tasks. It ensures that staff have access to clear documentation that explains their obligations and how to fulfil them lawfully. The Policy Framework is integral to our governance. (Details available at: csiro.au/en/about/Corporate-governance.)

The policies, approved by our Board, reflect our commitment to:

- research and technology
- science and delivery
- governance
- risk
- health, safety and environmental sustainability
- people
- child safety
- finance and shareholding
- privacy.

Our ongoing Policy Reform Project supports streamlining and integration of our policies, principles and procedures. It aims to drive improved transparency, accountability, efficiency and effectiveness in the daily work of all our people.

This year, we established a Child Safe Office to provide dedicated support to our operations as a child safe organisation. We are committed to the safety and wellbeing of all children and young people involved in our activities and programs. The welfare of the children in our care will always be our first priority.

Building better practice governance arrangements

Building on our existing arrangements, we are turning our attention to ensuring our future governance arrangements remain contemporary, are fit for purpose, and serve as drivers and enablers of our science. We have begun this work by consulting with governance customers across CSIRO to ask how we can better assist them, examining our Customer Engagement Framework and mapping the roles of committees and governance bodies across the organisation.

Ethics and Code of Conduct

Australia expects CSIRO to conduct its activities ethically and with integrity. The CSIRO Code of Conduct comprehensively sets out the standard of behaviour expected of our people and others working in the organisation. The Code of Conduct aligns with our values and articulates the standards of behaviour, principles and actions expected of all who work for CSIRO. All our people and affiliates must undertake training in the code as part of their induction and every 2 years.

Ethical conduct is a priority and we have procedures for Ethical Conduct in Human Research and Animal Welfare for the care and use of animals in scientific research. Our practices comply with national codes and relevant state and national legislative requirements. We operate 2 human research ethics committees to cover our social and interdisciplinary science and health and medical-related research. The committees provide independent, expert advice on appropriate engagement of people and communities in research and the use of human data. Issues such as privacy, informed consent, and the risks and benefits flowing from research are effectively managed through this review process. In 2021, these committees reviewed 320 new projects and provided ongoing monitoring and support for over 820 active projects at any given time. The impacts of COVID-19 and restrictions on national and international travel during this period resulted in many projects seeking approval for modifications to proposed research delivery methods to accommodate online formats or extended timeframes. New guidelines and processes were developed to support this work. Ethics committee meetings also continued to occur via videoconference or a hybrid (face to face/videoconference) format to meet government health guidelines.

We also operate 4 animal ethics committees that review our use of animals in research. This covers a range of fields, including wildlife conservation, farm animal production, nutrition, disease control and prevention, and human health. They also play an active role in monitoring the care and wellbeing of animals during any research and ensure we comply with all regulatory requirements. During 2021, these committees reviewed 101 new projects and provided ongoing support and monitoring for more than 350 projects at any given time.

The impacts of COVID-19 and travel restrictions created challenges for the delivery of animal research throughout the year, particularly in relation to the monitoring of remote fieldwork. In response, submissions were received from several project teams seeking approval for amendments to their project design to accommodate adapted methodologies or extensions to completion dates to allow for research activities to be temporarily suspended, where appropriate, and then restarted as travel restrictions were lifted. Best practice regarding animal welfare was maintained as a priority by all research teams and AECs throughout this period. Animal ethics committee meetings continued to occur via videoconference or a hybrid (face to face/videoconference) format to meet government health guidelines. A return to the standard practice of face-to-face meetings is expected to be implemented over the coming months.

Each year, we provide targeted training programs on human and animal research ethics to staff and ethics committee members to support and maintain capability levels for responsible research practice. These programs, which are regularly reviewed and updated, include broad and comprehensive training on human and animal research ethics standards and processes, as well as training on ethical issues in specific areas of research. We also provide online resources and individual advice to support best practice. Our Animal Welfare Procedure was reviewed and updated during the year to incorporate additional training requirements for all staff involved in animal research to ensure best practice.

The responsible conduct of our research is vital to maintain our trusted status, and our Science and Delivery Policy and Code of Conduct enshrine our adoption of the National Health and Medical Research Council's *Australian Code for the Responsible Conduct of Research (2018)*. We provide mandatory training for research staff and senior leaders in research integrity, targeted training on specific research conduct issues, and a network of Research Integrity Advisors across the organisation to support best practice and provide advice to our researchers. We proactively monitor and assess our organisational alignment with research integrity standards and the effectiveness of our management of any breaches of responsible conduct to ensure we maintain best practice approaches.

Remuneration of key management personnel, executives and other highly paid staff

Remuneration details are provided as required under the *Public Governance, Performance and Accountability Rule 2014* (PGPA Rule). Remuneration of key management personnel, senior executives and other highly paid staff is reported in detail in note 3.2 of the Financial statements in Part 5. Annual reportable remuneration includes base salary, benefits and allowances, performance payments, superannuation, termination benefits, long service leave and other short-term and long-term benefits. The remuneration reported has been calculated on an accrual basis and does not equal actual remuneration paid in 2021–22.

Enterprise agreements

Enterprise agreements set the terms and conditions of employment for our employees. Two enterprise agreements are in operation: the CSIRO Enterprise Agreement 2020–2023 and the CSIRO Canberra Deep Space Communication Complex (CDSCC) Enterprise Agreement 2018–2021.

The CSIRO Enterprise Agreement 2020–2023 came into operation on 15 November 2020. It reaches its nominal expiry date on 16 November 2023.

The CDSCC Enterprise Agreement 2018–2021 came into operation on 21 February 2019 and reached its nominal expiry date on 20 February 2022. In 2021, CDSCC staff supported a determination under CSIRO's enabling legislation to provide pay increases over the next 3 years rather than bargaining for a new agreement. The determination was effective from 22 December 2021.

Remuneration policy, strategy and governance

Our remuneration policy considers applicable remuneration provisions within both the CSIRO Enterprise Agreement 2020–2023 and the CSIRO Canberra Deep Space Communication Complex (CDSCC) Enterprise Agreement 2018–2021. Clause 11 and 12 of the CSIRO Enterprise Agreement 2020–2023 provides for market-related remuneration and individual flexibility arrangements. The remuneration policy also considers the Public Sector Workplace Relations Policy 2020, including the requirement for annual remuneration adjustments to be capped in line with the year-to-date percentage change in the Wage Price Index (WPI) for the Private Sector from the most recently released June quarter.

Key management personnel, executives and other highly paid staff are remunerated in accordance with their contracts of employment and relevant governing provisions. CSIRO's remuneration policy has also considered the Performance Bonus Guidance, including transition arrangements to remove performance bonuses in line with the Principles within the Guidance.

The Chief Executive is a position within the Commonwealth Principal Executive Officer structure. The Remuneration Tribunal sets the Total Remuneration reference rate and the maximum achievable performance payment.

Remuneration and allowances payable to members of the CSIRO Board are determined by the Australian Government Remuneration Tribunal for Part Time Office Holders. Determinations of the Remuneration Tribunal are established under the *Remuneration Tribunal Act 1973*.

The Board People and Safety Committee

The CSIRO Board People and Safety Committee assists the Board to fulfil its governance responsibilities for organisational development, people-related activities, and health and safety. In relation to remuneration and performance, this Committee:

- makes recommendations to the Board on the remuneration and performance of the Chief Executive, including possible key result areas and performance targets
- reviews the Chief Executive's decisions regarding the remuneration and performance assessment of Executive Team members, and ratifies these recommendations as appropriate
- exercises oversight of CSIRO's executive remuneration policy, including the senior executive banding structure (focus on positions, not individuals) and with references to the market
- specifically oversees negotiations with the Chief Executive or nominee regarding terms and conditions of appointment.

Remuneration Framework

The Chief Executive evaluates and determines the appropriate level of pay for executive positions in line with our executive remuneration policy. The base salary is a fixed component determined on a range of factors, including work value assessments, individual performance, competence and skill, internal relativities, and external market rates.

There is no longer an annual variable 'at-risk' component of remuneration in line with the application of Federal Government's 2021 Performance Bonus Guidance policy.

Annual remuneration review

Remuneration levels for executives are reviewed annually by the Chief Executive and the Board People and Safety Committee who assess any increases for the next financial year.

The annual remuneration review considers:

- market competitiveness
- individual performance
- organisation performance and affordability
- Wage Price Index for the Private Sector at the end of the June quarter.

Market-related remuneration arrangements may increase because of contract provisions aligned with Enterprise Agreement salary increases or by market-related adjustments, which are determined annually by the CSIRO Board People and Safety Committee.

The Committee makes recommendations to the CSIRO Board on the Chief Executive's remuneration and performance, including possible key result areas and performance targets. The CSIRO Board determines the Chief Executive's remuneration and any applicable performance payment within the range set by the Remuneration Tribunal after the Tribunal's annual determination of the reference rate.

Disclosure of interests and related entity transactions

Board members and the Chief Executive declare material interests as required under the SIR and PGPA Acts. The Board Governance document has processes for managing conflicts of interest, including a requirement that members remove themselves from discussions and voting where a member has declared a material personal interest, or where a potential or actual conflict of interest or duty arises.

In 2021–22, the Board did not consider any transactions where a Board member was also a director on or employed with the entity involved in the transaction.

CSIRO follows the Commonwealth Procurement Rules. Our system of delegated powers and authorisations for all procurement transactions ensures thorough consideration of all transactions. In accordance with the CSIRO Delegations, the CSIRO Board, as the accountable authority, approves transactions (commercial, property, procurement) when the overall value (total of all contributions from all parties) is above $20 million, or transactions that are high risks, are sensitive in nature and/or are long-term strategic commitments by the organisation. All major transactions are approved by the Board.

Transactions below $20 million and greater than $5 million are approved by the Chief Executive after the Major Transactions Committee, a sub-committee of the Executive Team, has reviewed the transactions against CSIRO policies and recommended them for Board or Chief Executive approval. All transactions under $5 million are approved by the suitable delegate in accordance with CSIRO procedures and Delegations and authority schedules as well as Government regulations.

During the reporting period, there were 48 transactions involving entities related to CSIRO above $10,000, which came to a total combined value of $31.4 million.

Reviews of outside bodies

The Senate Standing Committees on Economics examines our operations following the Federal Budget, the tabling of our annual report and the introduction to Parliament of the additional Appropriation Bills. This year, our senior executives appeared before the Committee during the Senate Estimates process on 3 occasions. The Committee did not review our Annual Report 2020–21.

Judicial decisions

During 2021–22, there were no judicial decisions or decisions of administrative tribunals that have had, or may have, a significant effect on our operations.

Service charter

Our service charter describes the standards of service that we aim to deliver to our customers and our commitment to ensuring that these standards are maintained.

In summary:

- We believe our customers and partners are essential to our success.
- We maintain relevance in our work through input from the public, government, industry and the research community.
- We communicate with our customers in a courteous, helpful and professional manner:
  - We respect customer confidentiality.
  - We evaluate our services to ensure continuous improvement of our service delivery.

Our complete service charter is available on our website.

We welcome feedback on our performance. Contact the CSIRO officer with whom you have been dealing or CSIRO Enquiries, which can direct your feedback to the relevant person:

Private Bag 10, Clayton South VIC 3169
1300 363 400
csiro.au/contact

Administrative Law

Freedom of Information

The *Freedom of Information Act 1982* (FOI Act) provides members of the public with a general right to obtain access to documents held by Australian Government agencies, including CSIRO.

The general right of access to documents is limited by exceptions to protect essential public interests and the privacy or business affairs of those who give information to the agency.

In the reporting year to 30 June 2022, we received 42 requests for documents or requests from other agencies to consider the release of documents relating to CSIRO, under the FOI Act.

General information about our FOI procedures, including how to make an FOI request, is available on our website.

Part V of the FOI Act provides a right to request CSIRO to amend a document to which lawful access has been granted, where the applicant claims that information in the document:

- relates to his or her personal affairs
- is incomplete, incorrect, out of date or misleading
- has been used, is being used or is available for use by the agency or Minister for an administrative purpose.

During 2021–22, we received no requests for amendments of personal information under the FOI Act.

Information Publication Scheme

We are required to publish information under the Information Publication Scheme, which promotes open and transparent communication of government information. This requirement, in Part II of the FOI Act, replaces the former requirement to publish a section 8 statement in an annual report. We provide a plan on our website showing what information we publish in keeping with the Information Publication Scheme requirements.

Members of the public may access scientific and technical publications from CSIRO Publishing and the ePublish Repository. Research data used by CSIRO is routinely published on the CSIRO Data Access Portal.

Archives, privacy and administrative decisions

Our archives collection includes material from the Council for Science and Industrial Research, the predecessor of CSIRO, dating from 1926. In accordance with the *Archives Act 1983* (Cth) (Archives Act), certain CSIRO records are held by the National Archives of Australia. Disposal arrangements for CSIRO records follow the Archives Act, and access to records over 20 years old is provided in accordance with that Act.

We are bound by the Australian Privacy Principles under the *Privacy Act 1988* (the Privacy Act) and have measures in place to manage compliance including our Privacy Management Plan and Data Breach Response Plan. During 2021–22, CSIRO had no Notifiable Data Breaches under the Notifiable Data Breaches Scheme.

The *Administrative Decisions (Judicial Review) Act 1977* enables a person aggrieved by certain classes of administrative decisions made by Australian Government agencies, including CSIRO, to obtain reasons for or to challenge those decisions. During 2021–22, we received no challenges or requests for statements of reasons under the Act.

Contact

All enquiries under the above legislation (including FOI requests) should be directed to:

FOI Officer/Privacy Officer
CSIRO
GPO Box 1700
Canberra ACT 2601
02 6276 6431

FOI@csiro.au
privacy@csiro.au

Public Interest Disclosure

We have implemented internal procedures to comply with the *Public Interest Disclosure Act 2013* (PID Act) through a Public Interest Disclosure Scheme (the PID Scheme).

The PID Scheme promotes integrity and accountability by encouraging the disclosure of information about suspected wrongdoing, protecting people who make disclosures and ensuring we take appropriate action. We contributed to the Commonwealth Ombudsman's annual report on the PID, as required by section 76(3) of the Act. In 2021–22, we received 1 public interest disclosures pursuant to section 26 of the PID Act.

Consultancy services

We engage consultants where we lack specialist expertise or when independent research, review or assessment is required. Consultants are typically engaged to investigate or diagnose a defined issue or problem; carry out defined reviews or evaluations; or provide independent advice, information or creative solutions to assist in our decision-making.

Before engaging consultants, we consider the skills and resources required for the task, the skills available internally and the cost-effectiveness of engaging external expertise. The decision to engage a consultant adheres to the Commonwealth Procurement Rules, CSIRO procurement procedures, the *Public Governance, Performance and Accountability Act 2013*, and the CSIRO Delegations and Authority Schedules.

Our policy on selection and engagement of consultants is based on the principles of:

- value for money
- open and effective competition
- ethics and fair dealing
- accountability and reporting
- national competitiveness and industry development
- support for other Australian Government policies.

CSIRO utilises the Department of Finance Procurement Publishing and Reporting Obligations (RMG 423) to determine consultants:

A consultancy is defined as the engagement of temporary services that:

- involve the development of an intellectual output that assists with decision making
- the intellectual output of which represents the independent view of the service provider.

Tables 4.2, 4.3 and 4.4 summarise the consultancies let and the annual spend, the reason for the consultancy and the procurement method. All values include goods and services tax.

Table 4.2: Annual spend on consultancies

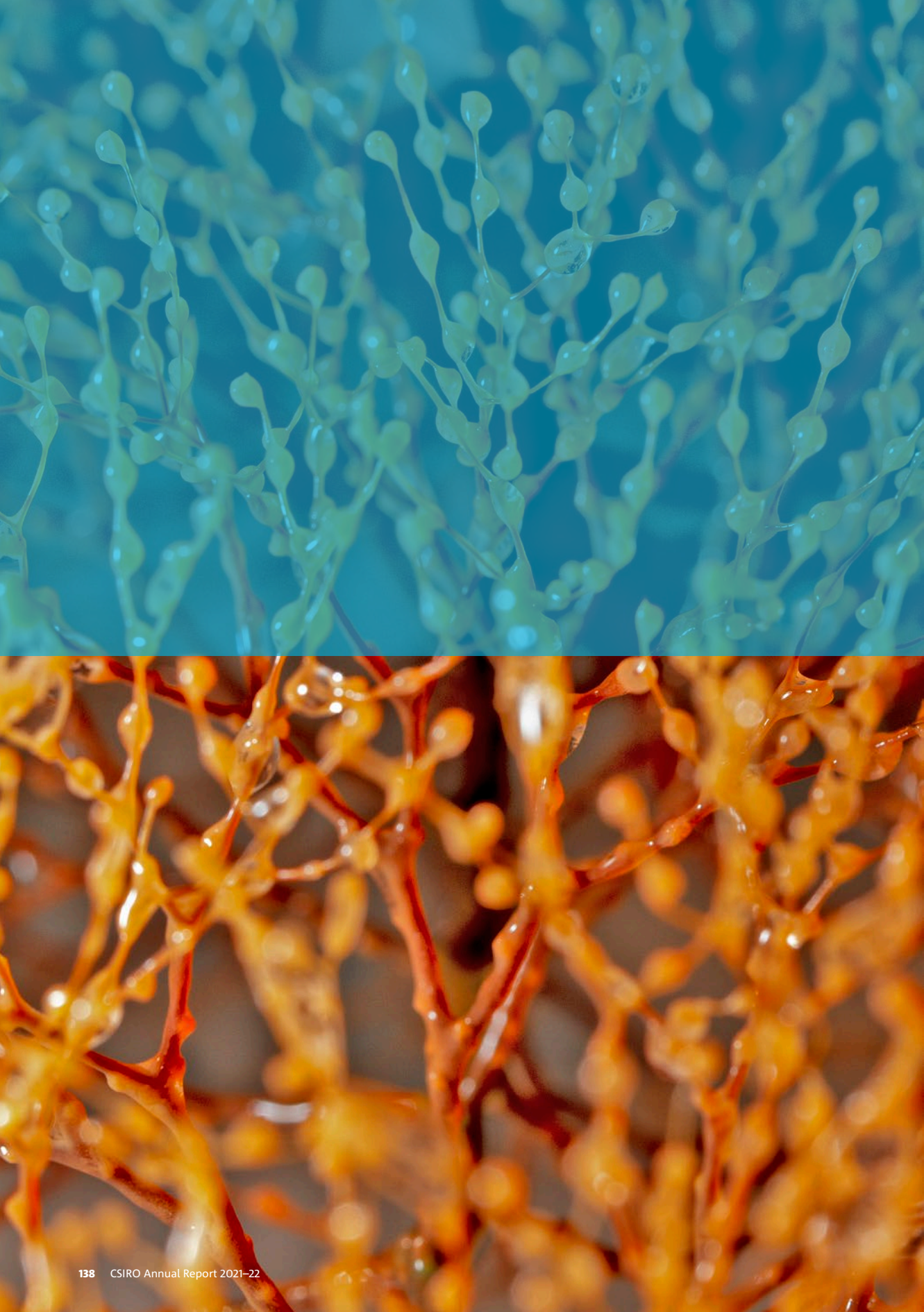
YEAR	SPENT ($)	LET ($) (ESTIMATED WHOLE OF LIFE)
2017–18	1,561,210	1,625,863
2018–19	1,553,566	1,700,668
2019–20	1,690,411	1,856,563
2020–21	1,184,510	2,077,655
2021–22	578,198	578,198

Table 4.3: Summary by reason code for 2021–22

CATEGORY CODE	REASON FOR CONSULTANCY	NUMBER OF CONSULTANCIES	VALUE ($)
IS	Need for independent study/evaluation	3	448,288
PA	Need for professional assistance to manage and facilitate change and its consequence	2	129,910
SS	Specialist skills not otherwise available	0	0
Total		**5**	**578,198**

Table 4.4: Summary by procurement method code for 2021–22

CATEGORY CODE	PROCUREMENT METHOD	NUMBER OF CONSULTANCIES	VALUE ($)
OT	Tenders sought from the marketplace through Open Approach (Request for Proposal, Request for Tender, Expressions of Interest)	0	–
PM	An existing panel member – this category includes standing offers, common use arrangements and approved supplier panels	2	483,010
ST	Tenders being sought from suppliers who have pre-qualified through some form of previous competitive process	0	–
RQ	Purchasing undertaken in accordance with Division 1 of the Commonwealth procurement rules (CPRs) and procurement did not require application of Division 2 of the CPRs	3	95,188
EX	Exemption applied that saw CSIRO undertake the procurement as a Limited Tender as defined in Division 2 of the CPRs	0	–



Part 5
Financial statements

INDEPENDENT AUDITOR'S REPORT

To the Minister for Industry and Science

Opinion

In my opinion, the financial statements of the Commonwealth Scientific and Industrial Research Organisation (the Entity) and the Consolidated Entity (the Entity and its subsidiaries) for the year ended 30 June 2022:

(a) comply with Australian Accounting Standards – Simplified Disclosures and the *Public Governance, Performance and Accountability (Financial Reporting) Rule 2015*; and

(b) present fairly the financial positions of the Entity and the Consolidated Entity as at 30 June 2022 and their financial performance and cash flows for the year then ended.

The financial statements of the Entity and the Consolidated Entity, which I have audited, comprise the following as at 30 June 2022 and for the year then ended:

- Statement by the Chair of the Board, Chief Executive and Chief Financial Officer;
- Statements of Comprehensive Income;
- Statements of Financial Position;
- Statement of Changes in Equity - Consolidated;
- Statement of Changes in Equity – CSIRO;
- Cash Flow Statement; and
- Notes to and forming part of the financial statements, comprising a summary of significant accounting policies and other explanatory information.

Basis for opinion

I conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. My responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of my report. I am independent of the Entity and the Consolidated Entity in accordance with the relevant ethical requirements for financial statement audits conducted by the Auditor-General and his delegates. These include the relevant independence requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants (including Independence Standards)* (the Code) to the extent that they are not in conflict with the *Auditor-General Act 1997*. I have also fulfilled my other responsibilities in accordance with the Code. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Accountable Authority's responsibility for the financial statements

As the Accountable Authority of the Entity, the board is responsible under the *Public Governance, Performance and Accountability Act 2013* (the Act) for the preparation and fair presentation of annual financial statements that comply with Australian Accounting Standards – Simplified Disclosures and the rules made under the Act. The board is also responsible for such internal control as the board determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the board is responsible for assessing the ability of the Entity and the Consolidated Entity to continue as a going concern, taking into account whether the entities' operations will cease as a result of an administrative restructure or for any other reason. The board is also responsible for

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disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the assessment indicates that it is not appropriate.

Auditor's responsibilities for the audit of the financial statements

My objective is to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian National Audit Office Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the financial statements.

As part of an audit in accordance with the Australian National Audit Office Auditing Standards, I exercise professional judgement and maintain professional scepticism throughout the audit. I also:

- identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control;
- obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Entity and the Consolidated Entity's internal control;
- evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Accountable Authority;
- conclude on the appropriateness of the Accountable Authority's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Entity or the Consolidated Entity's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify my opinion. My conclusions are based on the audit evidence obtained up to the date of my auditor's report. However, future events or conditions may cause the Entity or the Consolidated Entity's to cease to continue as a going concern;
- evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation; and
- obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Consolidated Entity to express an opinion on the financial report. I am responsible for the direction, supervision and performance of the Consolidated Entity audit. I remain solely responsible for my audit opinion.

I communicate with the Accountable Authority regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

Australian National Audit Office

Bola Oyetunji

Group Executive Director

Delegate of the Auditor-General

Canberra

5 September 2022

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
Financial Statements

for the period ended 30 June 2022

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STATEMENT BY THE CHAIR OF THE BOARD, CHIEF EXECUTIVE AND CHIEF FINANCE OFFICER

In our opinion, the attached financial statements for the period ended 30 June 2022 comply with subsection 42(2) of the Public Governance, Performance and Accountability Act 2013 (PGPA Act), and are based on properly maintained financial records as per subsection 41(2) of the PGPA Act.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and its subsidiaries will be able to pay their debts as and when they fall due.

This statement is made in accordance with a resolution of the directors.

Kathryn Fagg AO
Chair of the Board
2 September 2022

Larry Marshall
Chief Executive and Board Member
2 September 2022

Louise Coutts
Chief Finance Officer (Acting)
2 September 2022

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF COMPREHENSIVE INCOME
For the period ended 30 June 2022

		Consolidated		CSIRO	
		2022	2021	**2022**	2021
NET COST OF SERVICES	**Notes**	**$'000**	$'000	**$'000**	$'000
Expenses					
Employee benefits	1.1A	**753,506**	748,839	**751,008**	744,397
Suppliers	1.1B	**436,370**	424,372	**450,663**	441,636
Depreciation and amortisation	2.2A	**173,984**	182,713	**173,425**	182,087
Finance costs	1.1C	**1,506**	2,308	**1,438**	2,273
Write-downs and impairment loss on financial instruments	1.1D	**245**	906	**245**	906
Write-downs and impairment of other assets	1.1E	**10,590**	7,340	**10,590**	7,340
Loss on revaluation of investment properties		**-**	356	**-**	356
Losses from asset sales	1.1F	**-**	3,402	**-**	3,402
Foreign exchange losses		**-**	809	**-**	811
Total expenses		**1,376,201**	1,371,045	**1,387,369**	1,383,208
Own-Source Income					
Own-source revenue					
Revenue from contracts with customers	1.2A	**470,485**	431,111	**477,324**	437,008
Bank and term deposits interest	1.2B	**3,623**	3,425	**2,881**	2,755
Rental income	1.2C	**6,850**	7,538	**6,850**	7,538
Other revenues	1.2D	**14,715**	15,426	**14,072**	13,514
Total own-source revenue		**495,673**	457,500	**501,127**	460,815
Gains					
Gains from sale of equity investments and intellectual property		**409**	2,600	**409**	2,581
Gains from asset sales	1.1F	**113**	-	**113**	-
Gains on valuation of equity investments	4.2B	**191,563**	119,961	**35,909**	19,905
Gain on revaluation of investment properties		**1,731**	-	**1,731**	-
Other gains	1.2E	**17,847**	16,255	**17,847**	16,255
Foreign exchange gains		**292**	-	**173**	-
Total gains		**211,955**	138,816	**56,182**	38,741
Total own-source income		**707,628**	596,316	**557,309**	499,556
Net cost of services		**(668,573)**	(774,729)	**(830,060)**	(883,652)
Revenue from Government	1.2F	**949,037**	960,537	**949,037**	960,537
Surplus/(deficit)		**280,464**	185,808	**118,977**	76,885
OTHER COMPREHENSIVE INCOME					
Changes in asset revaluation reserves	1.3A	**22,781**	49,496	**22,781**	49,496
Changes in other reserves	1.3B	**(11)**	(56)	**-**	-
Total other comprehensive income		**22,770**	49,440	**22,781**	49,496
Total comprehensive income/(loss)		**303,234**	235,248	**141,758**	126,381
Surplus/(deficit) for the year is attributable to:					
Non-controlling interest		**98,414**	58,876	**-**	-
CSIRO		**182,050**	126,932	**118,977**	76,885
Total surplus/(deficit)		**280,464**	185,808	**118,977**	76,885
Total comprehensive income for the year is attributable to:					
Non-controlling interest		**98,414**	58,876	**-**	-
CSIRO		**204,820**	176,372	**141,758**	126,381
Total comprehensive income/(loss)		**303,234**	235,248	**141,758**	126,381

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF FINANCIAL POSITION
as at 30 June 2022

		Consolidated		CSIRO	
		2022	2021	**2022**	2021
	Notes	**$'000**	$'000	**$'000**	$'000
ASSETS					
Financial Assets					
Cash and cash equivalents	2.1A	**681,601**	537,636	**538,855**	403,872
Trade and other receivables	2.1B	**103,756**	88,974	**103,698**	85,206
Other investments	2.1C	**796,818**	477,903	**267,995**	214,650
Total financial assets		**1,582,175**	1,104,513	**910,548**	703,728
Non-Financial Assets[1]					
Land and buildings	2.2A	**1,540,912**	1,618,408	**1,540,723**	1,617,712
Heritage and cultural	2.2A	**9,952**	9,952	**9,952**	9,952
Plant and equipment	2.2A	**563,542**	540,596	**563,505**	540,452
Intangibles	2.2A	**18,502**	19,716	**18,502**	19,716
Investment properties	2.2B	**50,747**	49,016	**50,747**	49,016
Inventories		**1,290**	1,315	**1,290**	1,315
Other non-financial assets	2.2C	**11,886**	12,416	**11,644**	12,371
Total non-financial assets		**2,196,831**	2,251,419	**2,196,363**	2,250,534
Assets held for sale		**40,530**	5,200	**40,530**	5,200
Total assets		**3,819,536**	3,361,132	**3,147,441**	2,959,462
LIABILITIES					
Payables					
Suppliers	2.3A	**311,032**	218,014	**310,036**	213,989
Other payables	2.3B	**18,357**	16,034	**18,097**	15,716
Deposits	2.3C	**18,897**	21,800	**19,729**	23,469
Total payables		**348,286**	255,848	**347,862**	253,174
Interest Bearing Liabilities					
Lease liabilities	2.4	**63,653**	81,016	**63,529**	80,293
Total Interest bearing liabilities		**63,653**	81,016	**63,529**	80,293
Provisions					
Employee provisions	3.1A	**226,452**	264,700	**226,190**	264,483
Provision for remediation	2.5	**65,366**	62,776	**65,366**	62,776
Total provisions		**291,818**	327,476	**291,556**	327,259
Total liabilities		**703,757**	664,340	**702,947**	660,726
Net assets		**3,115,779**	2,696,792	**2,444,494**	2,298,736
EQUITY					
Contributed equity		**331,384**	327,384	**331,076**	327,076
Asset revaluation reserves		**1,595,506**	1,572,725	**1,595,506**	1,572,725
Other reserves		**(300)**	(259)	**-**	-
Retained surplus		**764,975**	582,925	**517,912**	398,935
Non-controlling interest		**424,214**	214,017	**-**	-
Total equity		**3,115,779**	2,696,792	**2,444,494**	2,298,736

The above Statement should be read in conjunction with the accompanying notes.

[1]Right-of-use ('ROU') assets are included in Land and buildings and Plant and equipment.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF CHANGES IN EQUITY – CONSOLIDATED
For the period ended 30 June 2022

	Retained earnings		Asset revaluation reserve		Other reserves		Contributed equity/capital		Non-controlling interest		Total equity	
	2022	2021	**2022**	2021	**2022**	2021	**2022**	2021	**2022**	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000
Opening balance	**582,925**	455,993	**1,572,725**	1,523,229	**(259)**	(203)	**327,384**	310,954	**214,017**	91,809	**2,696,792**	2,381,782
Comprehensive income												
Other comprehensive income[1]	**-**	-	**22,781**	49,496	**(11)**	(56)	**-**	-	**-**	-	**22,770**	49,440
Surplus/(deficit) for the period	**182,050**	126,932	**-**	-	**-**	-	**-**	-	**98,414**	58,876	**280,464**	185,808
Total comprehensive income/(loss)	**182,050**	126,932	**22,781**	49,496	**(11)**	(56)	**-**	-	**98,414**	58,876	**303,234**	235,248
Other movements	**-**	-	**-**	-	**(30)**	-	**-**	-	**-**	-	**(30)**	-
Contributions by owners												
Equity injection	**-**	-	**-**	-	**-**	-	**4,000**	16,430	**111,783**	63,332	**115,783**	79,762
Closing balance	**764,975**	582,925	**1,595,506**	1,572,725	**(300)**	(259)	**331,384**	327,384	**424,214**	214,017	**3,115,779**	2,696,792

The above Statement should be read in conjunction with the accompanying notes.

[1] Refer to Note 1.3.

Accounting Policy

Equity Injections

Amounts that are designated as equity injections for a year are recognised directly in contributed equity in that year.

Non-controlling interests

Non-controlling interests refer to equity in a subsidiary that is not attributable (directly or indirectly) to CSIRO as parent. CSIRO recognises non-controlling interests in the CSIRO Innovation Fund subsidiary entities.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF CHANGES IN EQUITY – CSIRO
For the period ended 30 June 2022

	Retained earnings		Asset revaluation reserve		Other reserves		Contributed equity/capital		Non-controlling interest		Total equity	
	2022	2021	**2022**	2021	**2022**	2021	**2022**	2021	**2022**	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000
Opening balance	**398,935**	322,050	**1,572,725**	1,523,229	**-**	-	**327,076**	310,646	**-**	-	**2,298,736**	2,155,925
Comprehensive income												
Other comprehensive income[1]	**-**	-	**22,781**	49,496	**-**	-	**-**	-	**-**	-	**22,781**	49,496
Surplus/(deficit) for the period	**118,977**	76,885	**-**	-	**-**	-	**-**	-	**-**	-	**118,977**	76,885
Total comprehensive income/(loss)	**118,977**	76,885	**22,781**	49,496	**-**	-	**-**	-	**-**	-	**141,758**	126,381
Other movements	**-**	-	**-**	-	**-**	-	**-**	-	**-**	-	**-**	-
Contributions by owners												
Equity injection	**-**	-	**-**	-	**-**	-	**4,000**	16,430	**-**	-	**4,000**	16,430
Closing balance	**517,912**	398,935	**1,595,506**	1,572,725	**-**	-	**331,076**	327,076	**-**	-	**2,444,494**	2,298,736

The above Statement should be read in conjunction with the accompanying notes.

[1]Refer to Note 1.3.

Accounting Policy

Equity Injections

Amounts that are designated as equity injections for a year are recognised directly in contributed equity in that year.

Non-controlling interests

Non-controlling interests refer to equity in a subsidiary that is not attributable (directly or indirectly) to CSIRO as parent. CSIRO recognises non-controlling interests in the CSIRO Innovation Fund subsidiary entities.

CONSOLIDATED FINANCIAL STATEMENTS
CASH FLOW STATEMENT
For the period ended 30 June 2022

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
OPERATING ACTIVITIES				
Cash received				
Receipts from Government	**949,037**	960,537	**949,037**	960,537
Sale of goods and rendering of services	**582,312**	506,929	**585,454**	516,630
Interest	**2,774**	3,181	**2,062**	2,253
Net GST received	**17,653**	13,807	**17,057**	13,134
Total cash received	**1,551,776**	1,484,454	**1,553,610**	1,492,554
Cash used				
Employees	**789,093**	743,647	**786,579**	739,381
Suppliers	**457,310**	460,127	**468,575**	477,567
Interest payments on lease liabilities	**1,381**	2,178	**1,360**	2,154
Finance costs	**125**	130	**78**	119
Deposits	**2,903**	708	**3,740**	2,119
Total cash used	**1,250,812**	1,206,790	**1,260,332**	1,221,340
Net cash from operating activities	**300,964**	277,664	**293,278**	271,214
INVESTING ACTIVITIES				
Cash received				
Proceeds from sales of equity investments and intellectual property	**442**	2,675	**442**	2,656
Proceeds from sales of property, plant and equipment	**1,405**	-	**1,405**	-
Total cash received	**1,847**	2,675	**1,847**	2,656
Cash used				
Purchase of property, plant and equipment	**130,381**	137,746	**130,300**	137,708
Purchase of equity investments	**126,845**	48,141	**17,038**	11,911
Other selling costs	**40**	29	**40**	29
Losses from sales of property, plant and equipment	**-**	4,321	**-**	4,321
Total cash used	**257,266**	190,237	**147,378**	153,969
Net cash used in investing activities	**(255,419)**	(187,562)	**(145,531)**	(151,313)
FINANCING ACTIVITIES				
Cash received				
Contributed equity	**115,783**	79,762	**4,000**	16,430
Total cash received	**115,783**	79,762	**4,000**	16,430
Cash used				
Principal payments of lease liabilities	**17,363**	35,724	**16,764**	35,078
Total cash used	**17,363**	35,724	**16,764**	35,078
Net cash from financing activities	**98,420**	44,038	**(12,764)**	(18,648)
Net increase (decrease) in cash held	**143,965**	134,140	**134,983**	101,253
Cash and cash equivalents at the beginning of the reporting period	**537,636**	403,496	**403,872**	302,619
Cash and cash equivalents at the end of the reporting period	**681,601**	537,636	**538,855**	403,872

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS

CONSOLIDATED FINANCIAL STATEMENTS
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS

Overview

Objectives of CSIRO and its Subsidiaries (the Group)

CSIRO is an Australian Government controlled not-for-profit entity and is classified as a Corporate Commonwealth entity under the *Public Governance, Performance and Accountability Act 2013*. CSIRO, together with its subsidiaries, is a research enterprise that aims to deliver scientific and innovative solutions for industry, society and the environment (referred to as 'the Group').

CSIRO is structured to meet the following outcome:

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

The continued existence of CSIRO and the Group in its present form and with its present programs is dependent on Government policy and on continued funding by Parliament for CSIRO's administration and programs.

The Basis of Preparation

The financial statements are required by section 42 of the *Public Governance, Performance and Accountability Act 2013* and are general purpose financial statements.

CSIRO and the Group's Consolidated Financial Statements have been prepared in accordance with:

- *Public Governance, Performance and Accountability (Financial Reporting Rule) 2015* (FRR); and
- *Australian Accounting Standards and Interpretations* – including simplified disclosures for Tier 2 Entities under *AASB 1060* issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

The financial statements have been prepared on an accrual basis and in accordance with the historical cost convention, except for certain assets and liabilities at fair value. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position. The financial statements are presented in Australian dollars and values are rounded to the nearest thousand dollars unless otherwise specified.

Key Judgements and Estimates

In the process of applying the Group's accounting policies, management has made a number of judgements and applied estimates and assumptions to future events. Information around judgements and estimates which are material to the financial statements are found in the following notes:

- Note 2.5 Provision for Remediation
- Note 3.1A Employee Provisions
- Note 4.3A Fair Value Measurement

Consolidation

The consolidated financial statements comprise the financial statements of the CSIRO and its subsidiaries. The subsidiaries of CSIRO are the Science and Industry Endowment Fund (SIEF), the CSIRO Chile Research Fundación (Fundación), National ICT Australia (NICTA), the Innovation Fund and the US Office. Refer to Note 3.4 for further information.

The consolidated financial statements incorporate the assets and liabilities of all entities controlled by CSIRO as at 30 June 2022 and the results of the controlled entities for the year then ended. Subsidiaries are consolidated from the date on which control is obtained through to the date on which control ceases.

The non-controlling interest in the results and equity of subsidiaries is shown separately in the statement of comprehensive income, statement of financial position and statement of changes in equity of the consolidated Group.

CONSOLIDATED FINANCIAL STATEMENTS
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS

Foreign Currency Translation

The functional currency of CSIRO and its Australian subsidiaries is Australian dollars. The Group has three overseas subsidiary entities, the Fundación and the US Office entities, with their functional currency being Peso CLP and US dollars respectively. On consolidation, those entities:

- Assets and liabilities are translated into Australian dollars at the rate of exchange prevailing at the reporting date; and
- The statement of comprehensive income is translated at average exchange rate.

The exchange rate differences arising are recognised in the net cost of services.

New Australian Accounting Standards

All new, revised and/or amending standards and/or interpretations that were issued prior to the signing of these statements and are applicable to the current reporting period did not have a material effect on the financial statements of the Group.

Standard/ Interpretation	Nature of change in accounting policy, transitional provisions, and adjustment to financial statements
AASB 1060 General Purpose Financial Statements – Simplified Disclosures for For-Profit and Not-for-Profit Tier 2 Entities	AASB 1060 applies to annual reporting periods beginning on or after 1 July 2021 and replaces the reduced disclosure requirements (RDR) framework. The application of AASB 1060 involves some reduction in disclosure compared to the RDR with no impact on the reported financial position, financial performance and cash flows of the entity.

There has been no early adoption of accounting standards applicable to future years.

Taxation

In accordance with Section 53 of the *Science and Industry Research Act 1949*, CSIRO is exempt from all forms of Australian taxation except the fringe benefits tax (FBT) and the goods and services tax (GST). The Group pays applicable taxes in overseas countries.

Revenues, expenses, assets and liabilities are recognised net of GST except:

- where the amount of GST incurred is not recoverable from the Australian Taxation Office; and
- for receivables and payables.

The SIEF is exempt from income tax in Australia. The Innovation Fund entities are subject to all applicable taxes in Australia. The Fundación is subject to all applicable taxes in Chile. The US Office is subject to taxes in the United States. NICTA is exempt from income tax however NICTA's subsidiaries (including NICTA IPR Pty Ltd) are subject to applicable taxes in Australia. The amounts of income and other tax payable by the Group's subsidiaries is not material to the consolidated statements.

Events after the Reporting Period

At the time of signing of the financial statements, the Group is not aware of any significant events occurring after the reporting date.

Future Events

CSIRO continues to explore future commercial opportunities for the Ginninderra Field Station, a 701 hectares area of land CSIRO owns in north Canberra. Due to the rapid urban growth in the surrounding area, the site has become under-utilised and the field station has been relocated to a more rural setting. As part of its focus on exploring the future possibilities for this site, CSIRO successfully requested the National Capital Authority (NCA) to include the site as 'Urban Area' on the General Policy Plan for Metropolitian Canberra in the National Capital plan draft Amendment 86. The Amendment became effective in November 2016.

The initial step in rezoning the land will allow CSIRO to explore avenues to divest the Ginninderra land in a commercially beneficial way. CSIRO proposes to divest Ginninderra east via a conditional sale. The conditions of the sale are necessary to meet community expectations that the land will be development with a significant component of sustainability.

1. Financial Performance

This section analyses the financial performance of CSIRO for the year ended 30 June 2022.

1.1. Expenses

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 1.1A: Employee Benefits				
Wages and salaries	**594,462**	573,254	**592,378**	567,678
Superannuation				
Defined contribution plans	**58,059**	53,158	**58,059**	53,158
Defined benefit plans	**40,016**	41,880	**39,914**	41,790
Leave and other entitlements	**58,270**	72,910	**58,037**	72,715
Separation and redundancies	**6,382**	17,764	**6,382**	17,764
Gross employee benefits	**757,189**	758,966	**754,770**	753,105
Less:				
Employee cost recovery	**(311)**	(1,809)	**(390)**	(390)
Capitalised labour	**(3,372)**	(8,318)	**(3,372)**	(8,318)
Total employee benefits	**753,506**	748,839	**751,008**	744,397

Accounting Policy

Accounting policy for employee related expenses is contained in Section 3. People and Relationships.

Note 1.1B: Suppliers				
Goods supplied	**119,839**	119,567	**118,950**	119,040
Services rendered	**306,229**	297,022	**321,646**	314,942
Total goods and services supplied or rendered	**426,068**	416,589	**440,596**	433,982
Other suppliers				
Short-term leases and leases of low-value assets	**6,243**	3,431	**6,244**	3,367
Audit Fees	**344**	-	**154**	-
Workers compensation expenses	**3,715**	4,352	**3,669**	4,287
Total other suppliers	**10,302**	7,783	**10,067**	7,654
Total Suppliers	**436,370**	424,372	**450,663**	441,636

CSIRO has short-term and low-value lease commitments of $0.59m as at 30 June 2022.

The above lease disclosures should be read in conjunction with the accompanying notes 1.1C, 1.2C, 2.2A and 2.4.

Accounting Policy

Short-term leases and leases of low-value assets

The Group has elected not to recognise right-of-use assets and lease liabilities for leases of assets that have a lease term of 12 months or less or leases of low-value assets (less than $10,000). The Group recognises the lease payments associated with these leases as an expense on a straight-line basis over the lease term.

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 1.1C: Finance Costs				
Interest on lease liabilities	**1,381**	2,178	**1,360**	2,154
Other interest payments	**125**	130	**78**	119
Total Finance costs	**1,506**	2,308	**1,438**	2,273

The above lease disclosures should be read in conjunction with the accompanying notes 1.1B, 1.2C, 2.2A and 2.4.

Note 1.1D: Write-downs and impairment loss on financial instruments				
Asset write-downs and impairments from:				
Bad debts written off	**178**	272	**178**	272
Impairment of trade and other receivables	**67**	634	**67**	634
Total write-downs and impairments on financial instruments	**245**	906	**245**	906
Note 1.1E: Write-downs and impairment of other assets				
Asset write-downs and impairments from:				
Land and Buildings	**7,342**	-	**7,342**	-
Property, plant and equipment	**3,248**	7,340	**3,248**	7,340
Total write-downs and impairment of other assets	**10,590**	7,340	**10,590**	7,340
Note 1.1F: Gain/(loss) from asset sales				
Land and buildings				
Proceeds from sale	**565**	**-**	**565**	**-**
Carrying value of assets sold	**(479)**	**-**	**(479)**	**-**
Selling expense	**(17)**	**-**	**(17)**	**-**
Net gain/(loss) from sale of land and buildings	**69**	**-**	**69**	**-**
Plant and equipment				
Proceeds from sale	**784**	1,116	**784**	1,116
Carrying value of assets sold	**(717)**	(4,489)	**(717)**	(4,489)
Selling expense	**(23)**	(29)	**(23)**	(29)
Net gain/(loss) from sale of plant and equipment	**44**	(3,402)	**44**	(3,402)
Total gain/(loss) from asset sales	**113**	(3,402)	**113**	(3,402)

1.2. Revenue and Gains

Own Source Revenue

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 1.2A: Revenue from contracts with customers				
Sale of goods	**11,628**	11,890	**11,628**	11,890
Rendering of services	**409,183**	380,305	**416,022**	386,202
Royalties and licence fees	**49,674**	38,916	**49,674**	38,916
Total revenue from contracts with customers	**470,485**	431,111	**477,324**	437,008

Disaggregation of revenue from contracts with customers

CSIRO derives its revenue under AASB 15 *Revenue from Contracts with Customers* from two main sources, being the sale of goods and rendering of services. Revenue has been disaggregated based on the line of business and further disaggregated based on the types of contracts that exist within the line of business. This disaggregation is considered most appropriate as it enables users of the Group's financial statements to understand the nature, timing and uncertainty of income and cash flows.

Revenue from contracts with customers - line of business:				
Impact Science				
Coinvestment	**235,278**	209,386	**242,117**	215,283
Consulting & Services	**59,020**	63,671	**59,020**	63,671
Royalties and licence fees	**49,099**	38,491	**49,099**	38,491
Total Impact Science	**343,397**	311,548	**350,236**	317,445
National Facilities & Collections				
Coinvestment	**56,009**	47,686	**56,009**	47,686
Consulting & Services	**32,899**	36,531	**32,899**	36,531
Royalties and licence fees	**325**	354	**325**	354
Total National Facilities & Collections	**89,233**	84,571	**89,233**	84,571
CSIRO Services				
Coinvestment	**9,286**	9,329	**9,286**	9,329
Consulting & Services	**18,542**	17,212	**18,542**	17,212
Royalties and licence fees	**250**	72	**250**	72
Publishing revenue	**2,374**	2,351	**2,374**	2,351
Total CSIRO Services	**30,452**	28,964	**30,452**	28,964
Enterprise Support Services				
Coinvestment	**5,836**	4,609	**5,836**	4,609
Consulting & Services	**1,567**	1,419	**1,567**	1,419
Total Enterprise Support Services	**7,403**	6,028	**7,403**	6,028
Total	**470,485**	431,111	**477,324**	437,008

Accounting Policy

Revenue from the sale of goods is recognised when control has been transferred to the buyer. A contract falls within the scope of AASB 15 *Revenue from Contracts with Customers* when the criteria for accounting for a contract with a customer is met as per paragraph 9 of the standard. Performance obligations are required by an enforceable contract with the satisfaction of these performance obligations either measured over time or a point in time.

The transaction price is the total amount of consideration to which CSIRO expects to be entitled in exchange for transferring promised goods or services to a customer. The consideration promised in a contract with a customer may include fixed amounts, variable amounts or both. Payment terms are specified in contracts, but are generally 30 days after the customer has been billed.

The following is a description of principal activities from which CSIRO generates its revenue:

Disaggregation	**Nature**	**Timing**
Coinvestment	CSIRO conducts research and facilitates the uptake of scientific technology solutions with a partner or customer to deliver a positive impact to Australia.	Performance obligations are typically satisfied over time, as the customer simultaneously receives and consumes the benefits associated with CSIRO conducting scientific research or CSIRO is creating/enhancing an asset (usually Intellectual Property) that an end customer controls as the asset is created or enhanced. The progress towards the completion of a performance obligation are typically measured using either milestones reached or time elapsed. In the absence of an observable output method, an input method is used to measure the progress towards the completion of the performance obligations.
Consulting & Services	Consulting services are where CSIRO applies existing research to a customer's data or assets to enhance the customer's intellectual property or processes. CSIRO is a provider of a range of specialised laboratories, scientific and testing equipment, and other research facilities. Services revenue includes facility management fees, and testing and calibrations services.	Performance obligations are satisfied at a point in time or over time depending on the nature of services provided. The methods used to measure the progress towards completion of a performance obligation are dependent on the services provided and generally follow either a milestones reached or time elapsed assessment.
Royalties & Licensing	CSIRO provides a license to a customer which gives the customer a right to access or a right to use CSIRO intellectual property.	If the licence provides the customer with the right to access CSIRO intellectual property as it exists throughout the license period, performance obligations are satisfied and revenue recognised over time. If the license provides the customer with the right to use CSIRO intellectual property when the license is granted, performance obligations and revenue is recognised at a point in time.
Publishing revenue	CSIRO Publishing publishes and distributes scientific, technical and health science books, magazines and journals from Australia to a worldwide audience.	Performance obligations are satisfied at a point in time as the customer purchases and receives the goods.

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 1.2B: Bank and term deposits interest				
Bank and term deposits	**3,623**	3,425	**2,881**	2,755

Accounting Policy

Interest revenue is recognised using the effective interest method as set out in AASB 9 *Financial Instruments*.

Note 1.2C: Rental Income				
Operating lease				
Lease income	**6,850**	7,538	**6,850**	7,538
Total Rental Income	**6,850**	7,538	**6,850**	7,538

Operating Leases

CSIRO has operating lease income receivables from the sub-leasing of offices and scientific research accommodation. The amounts below are GST inclusive.

Maturity analysis of operating lease income receivables

	Consolidated	CSIRO
	2022	**2022**
	$'000	**$'000**
Within 1 year	**6,243**	**6,243**
One to two years	**2,019**	**2,019**
Two to three years	**1,901**	**1,901**
Three to four years	**1,616**	**1,616**
Four to five years	**768**	**768**
More than 5 years	**1,729**	**1,729**
Total undiscounted lease payment receivable	**14,276**	**14,276**

The above lease disclosure should be read in conjunction with the accompanying notes 1.1B, 1.1C, 2.2A and 2.4.

Note 1.2D: Other revenues				
Sale of primary produce	**1,843**	1,153	**1,843**	1,153
Donation	**67**	337	**67**	337
Capital contributions	**9,936**	8,963	**9,936**	8,963
Education programs and subscriptions	**71**	132	**71**	132
Other	**2,798**	4,841	**2,155**	2,929
Total other revenues	**14,715**	15,426	**14,072**	13,514

Accounting Policy

Capital contributions includes income recognised from external parties when (or as) CSIRO has satisfied its obligation from the transfer of a financial asset.

Other includes the sale of CSIRO publications and products, conferences and funding for costs of suppliers and external service providers.

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 1.2E: Other gains				
Insurance proceeds	**-**	9,936	**-**	9,936
Assets received free of charge	**17,847**	6,319	**17,847**	6,319
Total other gains	**17,847**	16,255	**17,847**	16,255

Accounting Policy

Assets Received Free of Charge

Contributions of assets at no cost of acquisition or for nominal consideration are recognised as gains at their fair value when the asset qualifies for recognition, unless received from another Government entity as a consequence of a restructuring of administrative arrangements.

Note 1.2F: Revenue from Government				
Corporate Commonwealth Entity payment	**949,037**	960,537	**949,037**	960,537

Accounting Policy

Revenues from Government

Revenues from Government were received from the Australian Government Department of Industry, Science, Energy and Resources (appropriated to CSIRO as a Corporate Commonwealth Entity payment item).

1.3. Other Comprehensive Income

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Items that will not be classified to net cost of services				
Note 1.3A: Change in asset revaluation reserves				
Revaluation of land and buildings	**-**	50,807	**-**	50,807
Revaluation of plant and equipment	**22,781**	-	**22,781**	-
Revaluation of heritage and cultural assets	-	(1,311)	**-**	(1,311)
Net increase in asset revaluation reserves	**22,781**	49,496	**22,781**	49,496
Items that may be reclassified to net cost of services				
Note 1.3B: Change in other reserves				
Net change arising from foreign exchange movements on conversion of subsidiary accounts	**(11)**	(56)	**-**	-
Net (decrease) in other reserves	**(11)**	(56)	**-**	-

2. Financial Position

This section analyses CSIRO's assets used to generate financial performance and the operating liabilities incurred as a result.

Employee related information is disclosed in the People and Relationships section.

2.1. Financial Assets

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 2.1A: Cash and Cash equivalents				
Cash at bank and on hand	**204,701**	298,586	**128,105**	211,872
Term deposits	**476,900**	239,050	**410,750**	192,000
Total cash and cash equivalents	**681,601**	537,636	**538,855**	403,872

Accounting Policy

Cash is recognised at its nominal value. Cash and cash equivalents includes:

a) cash on hand;

b) demand deposits in bank accounts with an original maturity of 3 months or less that are readily convertible to known amounts of cash and subject to insignificant risk of changes in value.

Note 2.1B: Trade and other receivables				
Goods and services receivable				
Goods and services	**73,881**	54,053	**72,570**	50,634
Interest	**1,584**	735	**1,384**	565
Contract assets	**22,049**	25,924	**22,049**	25,924
GST receivable	**6,288**	5,437	**6,045**	5,328
Other receivables	**1,120**	3,924	**2,406**	3,444
Total trade and other receivables (gross)	**104,922**	90,073	**104,454**	85,895
Less: impairment loss allowance for trade and other receivables	**(1,166)**	(1,099)	**(756)**	(689)
Total trade and other receivables (net)	**103,756**	88,974	**103,698**	85,206
Trade and other receivables (gross) aged as follows				
Not overdue	**94,209**	79,450	**94,151**	75,272
Overdue by				
0 to 30 days	**6,140**	5,920	**6,140**	5,920
31 to 60 days	**420**	1,194	**420**	1,194
61 to 90 days	**147**	1,329	**147**	1,329
More than 90 days	**4,006**	2,180	**3,596**	2,180
Total receivables (gross)	**104,922**	90,073	**104,454**	85,895
Reconciliation of impairment loss allowance				
Opening balance	**1,099**	1,090	**689**	681
Increase /(decrease) recognised in net surplus	**67**	9	**67**	8
Closing balance	**1,166**	1,099	**756**	689

Contract assets are associated with services that have been transferred to the customer by CSIRO but there are remaining services to be performed in order to invoice the customer. Refer to Note 2.3A for information relating to contract liabilities.

Accounting Policy

Financial assets

Trade receivables, loans and other receivables that are held for the purpose of collecting the contractual cash flows where the cash flows are solely payments of principal and interest, that are not provided at below-market interest rates, are subsequently measured at amortised cost using the effective interest method adjusted for any loss allowance. Receivables for goods and services, which have 30 day terms, are recognised at the nominal amounts due less any impairment.

Accounting Policy (cont'd)

Impairment of Financial assets

The simplified approach for trade, contract and lease receivables is used. This approach always measures the loss allowance as the amount equal to the lifetime expected credit losses. A write-off constitutes a de-recognition event where the write off directly reduces the gross carrying amount of the financial asset.

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 2.1C: Other Investments				
Listed companies	**83,480**	16,464	**83,480**	16,464
Unlisted companies	**92,523**	123,448	**76,865**	107,681
Innovation Fund	**610,863**	328,148	**97,698**	80,662
Uniseed Investment	**9,952**	9,843	**9,952**	9,843
Total investments	**796,818**	477,903	**267,995**	214,650

Movements within each of the above categories between the 2022 and 2021 financial years are attributed to either purchases or disposal of investments or changes in the fair value of investments. During the period one security moved from unlisted to listed companies.

Accounting Policy

CSIRO has investments in a number of unlisted start-up companies over which it does not have significant influence or control. These companies have been established for the purpose of commercialisation of CSIRO's intellectual property. CSIRO also has some investments in companies which have been listed on the Australian Stock Exchange and in the Uniseed trust. CSIRO, as part of the National Innovation and Science Agenda, has also established and invested in an Innovation Fund to invest in the development of early stage technology opportunities. Refer to Note 3.4 Related Party Disclosures for more information.

CSIRO's other investments are accounted for in accordance with AASB 9 *Financial Instruments*. See note 4.2 and 4.3 for further information.

2.2. Non-Financial Assets

Note 2.2A: Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles

(a) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles for 2022 - Consolidated

	Land $'000	Buildings $'000	Total land and buildings $'000	Plant and equipment $'000	Heritage and cultural $'000	Intangibles $'000	Total $'000
As at 1 July 2021							
Gross book value	**411,686**	**3,032,053**	**3,443,739**	**1,224,482**	**150,061**	**60,808**	**4,879,090**
Accumulated depreciation and amortisation	**-**	**(1,825,331)**	**(1,825,331)**	**(683,886)**	**(140,109)**	**(41,092)**	**(2,690,418)**
Net book value as at 1 July 2021	**411,686**	**1,206,722**	**1,618,408**	**540,596**	**9,952**	**19,716**	**2,188,672**
Additions:							
By purchase	**-**	**58,287**	**58,287**	**74,833**	**-**	**1,323**	**134,443**
Right-of-use assets	**-**	**7,599**	**7,599**	**676**	**-**	**-**	**8,275**
Assets first recognised through a gain in net cost of services	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Reclassification	**(844)**	**898**	**54**	**(672)**	**-**	**618**	**-**
Revaluations recognised in other comprehensive income	**-**	**-**	**-**	**22,781**	**-**	**-**	**22,781**
Impairments recognised in net cost of services	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Write-offs and impairments on right-of-use assets recognised in net cost of services	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Depreciation expense	**-**	**(70,969)**	**(70,969)**	**(69,684)**	**-**	**(3,155)**	**(143,808)**
Depreciation on right-of-use assets	**-**	**(29,244)**	**(29,244)**	**(932)**	**-**	**-**	**(30,176)**
Total depreciation and amortisation	**-**	**(100,213)**	**(100,213)**	**(70,616)**	**-**	**(3,155)**	**(173,984)**
Disposals	**(185)**	**(7,610)**	**(7,795)**	**(4,047)**	**-**	**-**	**(11,842)**
Disposals of Right-of-Use Assets	**-**	**(99)**	**(99)**	**-**	**-**	**-**	**(99)**
Other movements	**(29,683)**	**(5,647)**	**(35,330)**	**(9)**	**-**	**-**	**(35,339)**
Assets held for sale or in a disposal group held for sale	**34,883**	**5,647**	**40,530**				**40,530**
Other movements of right-of-use assets	**-**	**1**	**1**	**-**	**-**	**-**	**1**
Net book value as at 30 June 2022	**415,857**	**1,165,585**	**1,581,442**	**563,542**	**9,952**	**18,502**	**2,173,438**
Net book value as at 30 June 2022 represented by:							
Gross book value	**415,857**	**3,029,676**	**3,445,533**	**1,380,256**	**150,061**	**62,623**	**5,038,473**
Accumulated depreciation and amortisation	**-**	**(1,864,091)**	**(1,864,091)**	**(816,714)**	**(140,109)**	**(44,121)**	**(2,865,035)**
Total as at 30 June 2022	**415,857**	**1,165,585**	**1,581,442**	**563,542**	**9,952**	**18,502**	**2,173,438**
Carrying amount of right-of-use assets	**-**	**130,266**	**130,266**	**1,958**	**-**	**-**	**132,224**

All revaluations were conducted in line with the revaluation policy stated with this note.

(b) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles for 2022 - CSIRO

	Land $'000	Buildings $'000	Total land and buildings $'000	Plant and equipment $'000	Heritage and cultural $'000	Intangibles $'000	Total $'000
As at 1 July 2021							
Gross book value	**411,686**	**3,030,493**	**3,442,179**	**1,223,594**	**150,061**	**60,808**	**4,876,642**
Accumulated depreciation and amortisation	-	**(1,824,467)**	**(1,824,467)**	**(683,142)**	**(140,109)**	**(41,092)**	**(2,688,810)**
Net book value as at 1 July 2021	**411,686**	**1,206,026**	**1,617,712**	**540,452**	**9,952**	**19,716**	**2,187,832**
Additions							
By purchase	-	**58,288**	**58,288**	**74,829**		**1,323**	**134,440**
Right-of-use assets	-	**7,599**	**7,599**	**676**			**8,275**
Assets first recognised through a gain in net cost of services	-	-	-	-	-	-	-
Reclassification	**(844)**	**898**	**54**	**(672)**	-	**618**	-
Revaluations recognised in other comprehensive income	-	-	-	**22,781**	-	-	**22,781**
Impairments recognised in net cost of services	-	-	-	-	-	-	-
Write-offs and impairments on right-of-use assets recognised in net cost of services	-	-	-	-	-	-	-
Depreciation expense	-	**(70,969)**	**(70,969)**	**(69,632)**	-	**(3,155)**	**(143,756)**
Depreciation on right-of-use assets	-	**(28,737)**	**(28,737)**	**(932)**	-	-	**(29,669)**
Total depreciation and amortisation	-	**(99,706)**	**(99,706)**	**(70,564)**	-	**(3,155)**	**(173,425)**
Disposals	**(185)**	**(7,610)**	**(7,795)**	**(4,047)**	-	-	**(11,842)**
Disposals of Right-of-Use Assets	-	**(99)**	**(99)**	-	-	-	**(99)**
Other movements	**(29,683)**	**(5,647)**	**(35,330)**	**50**	-	-	**(35,280)**
Assets held for sale or in a disposal group held for sale	**34,883**	**5,647**	**40,530**				**40,530**
Other movements of right-of-use assets	-	-	-	-	-	-	-
Net book value as at 30 June 2022	**415,857**	**1,165,396**	**1,581,253**	**563,505**	**9,952**	**18,502**	**2,173,212**
Net book value as at 30 June 2022 represented by:							
Gross book value	**415,857**	**3,027,973**	**3,443,830**	**1,379,482**	**150,061**	**62,623**	**5,035,996**
Accumulated depreciation and amortisation	-	**(1,862,577)**	**(1,862,577)**	**(815,977)**	**(140,109)**	**(44,121)**	**(2,862,784)**
Total as at 30 June 2022	**415,857**	**1,165,396**	**1,581,253**	**563,505**	**9,952**	**18,502**	**2,173,212**
Carrying amount of right-of-use assets	-	**130,077**	**130,077**	**1,958**	-	-	**132,035**

All revaluations were conducted in line with the revaluation policy stated with this note.

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Contractual commitments for fixed assets:				
Capital commitments comprise outstanding payments for buildings under construction and commitments for purchase of plant and equipment. Commitments are reported inclusive of GST.				
Land and buildings	**124,218**	55,088	**124,218**	55,088
Plant and equipment	**14,710**	6,366	**14,710**	6,366
Total commitments payable	**138,928**	61,454	**138,928**	61,454
Within 1 year	**132,036**	51,079	**132,036**	51,079
Between 1 to 5 years	**6,892**	10,375	**6,892**	10,375
More than 5 years	**-**	-	**-**	-
Total commitments payable	**138,928**	61,454	**138,928**	61,454

Accounting Policy

Acquisition of Assets

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Assets acquired at no cost or for nominal considerations are initially recognised as assets and revenues at their fair value at the date of acquisition.

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the Statement of Financial Position, except for purchases costing less than $5,000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total).

Lease Right of Use (ROU) Assets

Leased ROU assets are capitalised at the commencement date of the lease and comprise of the initial lease liability amount, initial direct costs incurred when entering into the lease less any lease incentives received. These assets are accounted for by CSIRO as separate asset classes to corresponding assets owned outright, but included in the same column as where the corresponding underlying assets would be presented if they were owned.

Revaluations

Following initial recognition at cost, property, plant and equipment (excluding intangibles and ROU assets) are carried at fair value less accumulated depreciation and accumulated impairment losses. Valuations are conducted with sufficient frequency to ensure the carrying amount of assets do not differ materially from the assets' fair value as at reporting date. Valuations are conducted every three years for assets that fall within the following classes - land, buildings, plant and equipment and heritage and cultural. Investment properties are valued every year.

Revaluation adjustments are made on a class basis. Any revaluation increment is credited to equity under asset revaluation reserve, except to the extent that it reverses a previous revaluation decrement of the same asset class that was previously recognised in the surplus or deficit. Revaluation decrements for a class of assets are recognised directly through the statement of comprehensive income except to the extent that they reverse a previous revaluation increment for that class.

Any accumulated depreciation as at the revaluation date is restated proportionately with the change in the gross carrying amount of the asset so that the carrying amount of the asset after revaluation equals its revalued amount.

Fair value for each class of asset subject to the fair value model is determined as follows:

- Land, which will continue to be used to further the Group's objectives for research activity, is valued by independent valuers at fair value (highest and best use). Highest and best use is determined from the perspective of market participants. An entity's current use of a non-financial asset is presumed to be its highest and best use unless market or other factors suggest otherwise. Land underwent a full revaluation as at 30 June 2021 by Jones Lang LaSalle (JLL).
- Buildings and leasehold improvements, which will continue to be used to further the Group's objectives, are valued by independent valuers at fair value (highest and best use). Building valuations include plant, fit-outs, fixtures and fittings, which form an integral part of buildings. Buildings underwent a full revaluation as at 30 June 2021 by JLL.
- Plant and equipment which will continue to be used to further the Group's objectives, are valued by independent valuers at fair value (highest and best use). Plant and equipment underwent a full revaluation as at 30 June 2022 by JLL.

Accounting Policy (cont'd)

- Properties held for sale are valued at the lower of their carrying amount and fair value less cost to sell. An assessment is undertaken annually of any properties held for sale.
- Heritage and cultural assets are valued by independent valuers at their depreciated replacement cost. Heritage and cultural assets underwent a full revaluation as at 30 June 2021 by JLL.

In addition to independent valuations conducted, CSIRO makes an internal assessment at balance date considering any major events, market changes or indicators of impairment that may impact on fair value.

Depreciation and Amortisation

Depreciable property, plant and equipment assets are written-off to their estimated residual values over their estimated useful lives using, in all cases, the straight-line method of depreciation. Leasehold improvements are depreciated on a straight-line basis over the lesser of the estimated useful life of the improvements or the unexpired period of the lease. Land is not depreciated. The depreciation rates for ROU assets are based on the commencement date to the earlier of the end of the useful life of the ROU asset or the end of the lease term.

Depreciation/amortisation rates (useful lives), residual values and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

Depreciation rates applying to each class of depreciable asset are based on the following useful lives for 2021-22 and 2020-21:

Asset Class	Class of Depreciable Asset	
Land and Buildings	Buildings on freehold land	40 to 80 years
Land and Buildings	Leasehold Improvements	Lease term
Right of Use Asset	Buildings under lease	Lease term
Right of Use Asset	Equipment under lease	Lease term
Plant and Equipment	Passenger vehicles	7 years
Plant and Equipment	Agricultural and transport equipment	8 to 20 years
Plant and Equipment	Computer Equipment	2 to 5 years
Plant and Equipment	Scientific Equipment	5 to 20 years
Plant and Equipment	Furniture and office equipment	5 to 15 years
Plant and Equipment	Workshop equipment	20 to 25 years
Plant and Equipment	Research vessel	25 years
Plant and Equipment	Australia telescope	15 to 58 years
Heritage and Cultural	Heritage and Cultural	Indefinite

Impairment

All assets were assessed for impairment as at 30 June 2022. Where indicators of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

The recoverable amount of an asset is the higher of its fair value less costs to sell and its value in use. Value in use is the present value of the future cash flows expected to be derived from the asset. Where the future economic benefit of an asset is not primarily dependent on the asset's ability to generate future cash flows, and the asset would be replaced if the entity were deprived of the asset, its value in use is taken to be its depreciated replacement cost.

Derecognition

An item of property, plant and equipment is derecognised upon disposal or when no further future economic benefits are expected from its use or disposal.

Heritage and Cultural Assets

Heritage and cultural items include buildings of historical or cultural significance. CSIRO has classified them as heritage and cultural assets as they are primarily used for purposes that relate to their cultural significance and original purpose. Heritage and cultural assets are stored and managed in ways to preserve their heritage and cultural value over time. Where conservation and preservation activities, specified in an asset's Heritage Management Plan, demonstrate that an asset will be maintained for an indefinite period, these items are considered to have indefinite useful lives and therefore, not subject to depreciation. Copies of the Heritage Management Plans may be obtained by contacting enquiries@csiro.au.

Intangibles

Intangibles are internally developed and acquired software for internal use. These assets are carried at cost, less accumulated amortisation and impairment losses, except where the estimated cost of software is less than the $250,000 threshold and expensed in the year of acquisition. Software are amortised on a straight-line basis over their anticipated useful lives. The useful lives are 2 to 10 years (2020-21: 2 to 10 years). All software assets were assessed for indications of impairment as at 30 June 2022.

Accounting Policy (cont'd)

Properties Held for Sale

Properties which are expected to be recovered primarily through sale rather than through continuing use are classified as 'properties held for sale'. Immediately before classification, the properties are remeasured in accordance with the Group's accounting policies. Thereafter, at reporting date the properties are measured at the lower of their carrying amount and fair value less cost to sell.

Impairment losses on initial classification as held for sale and subsequent gains or losses on re-measurement are recognised in the Statement of Comprehensive Income.

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 2.2B: Investment properties				
Reconciliation of the opening and closing balances of investment properties				
As at 1 July	**49,016**	49,373	**49,016**	49,373
Net gain/(loss) from fair value adjustments	**1,731**	(357)	**1,731**	(357)
Total as at 30 June	**50,747**	49,016	**50,747**	49,016

Accounting Policy

Investment properties are measured initially at cost, including transaction costs. Subsequent to initial recognition, investment properties are stated at fair value. Gains or losses arising from changes in the fair values of investment properties are recognised in profit or loss in the year in which they arise.

Investment properties are derecognised either when they have been disposed of or when the investment property is permanently withdrawn from use and no future economic benefit is expected from its disposal. Any gain or losses on disposal of an investment property are recognised in profit or loss in the year of disposal.

Investment properties were valued as at 30 June 2022 by JLL and CSIRO are of the opinion that there are no significant material differences between the carrying amounts of investment properties and fair value. The valuation was undertaken utilising the JLL proprietary valuation model. The opinion of the market value was based on both the capitalisation of net income and discounted cash flows approaches. Rental income from investment properties is included in the lease income disclosed in Note 1.2C and was $3.6m for 2022 (2021:$2.9m). Both investment properties are owned by CSIRO.

Note 2.2C: Other non-financial assets				
Prepayments	**11,886**	12,416	**11,644**	12,371
Total other non-financial assets	**11,886**	12,416	**11,644**	12,371

2.3. Payables

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 2.3A: Suppliers				
Suppliers payable	**65,847**	49,957	**65,559**	47,374
Contract liabilities	**245,185**	168,057	**244,477**	166,615
Total	**311,032**	218,014	**310,036**	213,989

Refer to Note 2.1B for information relating to contract assets.

Accounting Policy

Contract liabilities are associated with consideration that has been received from the customer but services are yet to be performed by the Group.

Note 2.3B: Other Payables				
Accrued salaries and wages	**18,019**	15,354	**17,996**	15,318
Other creditors and accrued expenses	**338**	680	**101**	398
Total other payables	**18,357**	16,034	**18,097**	15,716

Accounting Policy

Accounting policy for contract revenue received in advance is contained in Note 1.2.

Note 2.3C: Deposits				
STEM Academy	**16,182**	18,683	**16,182**	18,683
Other	**2,715**	3,117	**3,547**	4,786
Total deposits	**18,897**	21,800	**19,729**	23,469

Deposits represent monies held on behalf of third parties. If the amounts are not spent for their specified purpose they will be returned to the third party.

2.4. Interest Bearing Liabilities

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 2.4: Leases				
Lease liabilities				
Buildings	**61,661**	78,779	**61,537**	78,056
Plant and equipment	**1,992**	2,237	**1,992**	2,237
Total Leases	**63,653**	81,016	**63,529**	80,293
Maturity analysis - contractual undiscounted cash flows				
Within 1 year	**21,286**	25,863	**18,143**	25,271
Between 1 to 5 years	**43,846**	51,141	**43,846**	50,994
More than 5 years	**4,264**	7,885	**4,264**	7,885
Total Leases	**69,396**	84,889	**66,253**	84,150

The cash outflow for leases for the year ended 30 June 2022 was $18.12m (2021: $37.23m) for CSIRO and $18.74m for the Group (2021: $37.90m). Both the Group and CSIRO have multiple leasing arrangements relating to land, buildings and equipment.

The above lease disclosures should be read in conjunction with the accompanying notes 1.1B, 1.1C, 1.2C, 2.2A.

Accounting Policy

For all new contracts entered into, CSIRO considers whether the contract is, or contains, a lease. A lease is defined as 'a contract, or part of a contract, that conveys the right to use an asset (the underlying asset) for a period of time in exchange for consideration'.

Once it has been determined that a contract is, or contains a lease, the lease liability is initially measured at the present value of the lease payments unpaid at the commencement date, discounted using the interest rate implicit in the lease, if that rate is readily determinable, or the incremental borrowing rate.

Subsequent to initial measurement, the liability will be reduced for payments made and increased for interest. It is remeasured to reflect any reassessment or modification to the lease. When the lease liability is remeasured, the corresponding adjustment is reflected in the right-of-use asset or profit and loss depending on the nature of the reassessment or modification.

2.5. Other Provisions

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 2.5: Provision for Remediation				
Provision for Remediation	**65,366**	62,776	**65,366**	62,776
Total Provision for Remediation	**65,366**	62,776	**65,366**	62,776

Provision for Remediation Reconciliation	**$'000**	**$'000**
As at 1 July 2021	**62,776**	**62,776**
Additional provisions made	**3,567**	**3,567**
Amounts used	**(1,049)**	**(1,049)**
Amounts reversed	**(34)**	**(34)**
Unwinding of discount	**106**	**106**
Total as at 30 June 2022	**65,366**	**65,366**

CSIRO currently has provisions for remediation associated with:

- Restoring land and decontaminating land; and
- Restoring leased CSIRO sites to their original condition at the conclusion of the lease, represented in the agreements for the leasing of the premises.

Accounting Judgements and Estimates

The provision for restoring and decontaminating land is based on estimates provided by internal and external qualified experts. The provision is predominately based on externally provided costings, with additional amounts derived from comparable remediation works. The provision is based on the scope of work as it currently stands as at 30 June 2022, where the effect of the time value of money is deemed immaterial. As remediation work progress, the scope and costs may be subject to change. The work is expected to take several years to reach completion.

The provision for the makegood/restoration costs at leased CSIRO sites are based on rates provided by an external valuer.

3. People and Relationships

This section describes a range of employment and post employment benefits provided to our people and our relationship with other key people.

3.1. Employee Provisions

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 3.1A: Employee Provisions				
Annual leave	**70,426**	71,022	**70,164**	70,805
Long service leave	**144,580**	174,327	**144,580**	174,327
Separation and Redundancy	**3,414**	11,009	**3,414**	11,009
Severance pay	**8,032**	8,342	**8,032**	8,342
Total employee provisions	**226,452**	264,700	**226,190**	264,483

Accounting Policy (including Accounting Judgements and Estimates)

Liabilities for short-term employee benefits (as defined in AASB 119 *Employee Benefits*) and termination benefits due within twelve months of the end of the reporting period are measured at their nominal amounts. The nominal amount is calculated with regard to the rate expected to be paid on settlement of the liability.

Other long-term employee benefit liabilities are measured at the present value of the estimated future cash outflows to be made in respect of services provided by employees up to the reporting date.

Leave

The liability for employee benefits includes provisions for annual leave and long service leave. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees is estimated to be less than the annual entitlement for sick leave.

The leave liabilities are calculated on the basis of employees' remuneration at the estimated salary rates that will apply at the time the leave is taken, including the employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination.

The liability at 30 June 2022 for long service leave and annual leave has been determined by the short hand method and reference to the work of the Australian Government Actuary (AGA). The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Separation and Redundancy

Provision is made for separation and redundancy benefit payments. A CSIRO plan of termination is binding when the following criteria are met:

- actions required to complete the plan indicate that it is unlikely that significant changes to the plan will be made;
- the plan identifies the number of employees whose employment is to be terminated; and
- the plan established the termination benefits that employees will receive.

Superannuation

Employees of CSIRO are members of the Commonwealth Superannuation Scheme (CSS), the Public Sector Superannuation Scheme (PSS), the PSS accumulation plan (PSSap) or industry schemes. The CSS and PSS are defined benefit schemes for the Australian Government. The PSSap is a defined contribution scheme.

The liability for defined benefits is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course. This liability is reported in the Department of Finance's administered schedules and notes.

CSIRO makes employer contributions to the employee superannuation schemes at rates determined by an actuary to be sufficient to meet the cost to the Government of the superannuation entitlements of the Group's employees. CSIRO accounts for the contributions as if they were contributions to defined contribution plans.

The liability for superannuation recognised as at 30 June 2022 represents outstanding contributions for the financial year.

3.2 (a) Key Management Personnel Remuneration

Key management personnel are those persons having authority and responsibility for planning, directing and controlling the activities of CSIRO, directly or indirectly, including any director of CSIRO. Those key management personnel along with their remuneration are reported in table below.

		Short Term Benefits			Post Employment Benefits	Other Long Term Benefits			
CSIRO Key Management Personnel	Position	Base Salary $	Salary at risk payments $	Other Benefits and Allowances $	Super-annuation Contributions $	Long Service Leave $	Other Long Term Benefits $	Termination Benefits $	Total Remuneration $
Marshall, Larry	Chief Executive	705,312	209,993	25,016	23,933	4,754	-	-	969,008
Zielke, Judi	Chief Operating Officer	234,564	26,580	-	42,284	8,139	-	-	311,567
Tom Munyard	Chief Operating Officer	167,709	-	10,351	22,310	9,825	-	-	210,195
Mayfield, Peter	Executive Director - Environment, Energy & Resources	491,830	27,225	24,870	68,856	4,848	-	-	617,629
Rose, Kirsten	Executive Director - Future Industries	445,649	24,640	24,870	23,810	5,716	-	-	524,685
Elanor Huntington	Executive Director - Digital, National Facilities and Collections	299,179	-	16,198	55,691	3,113	-		374,181
Williams, David	Executive Director - Digital, National Facilities and Collections	176,146	36,122	10,109	10,911	6,858	-	150,231	390,377
Total remuneration for CSIRO Key Management Personnel		2,520,389	324,560	111,414	247,795	43,253	-	150,231	3,397,642
CSIRO Subsidiary Key Management Personnel									
Jimenez, Orlando	Fundacion CEO	246,409	-	4,116	-	-	-	-	250,525
Total remuneration for Fundacion		246,409	-	4,116	-	-	-	-	250,525
Total Consolidated Remuneration for Key Management Personnel		2,766,798	324,560	115,530	247,795	43,253	-	150,231	3,648,167

Performance payments represent remuneration amounts at risk within employment contracts. Actual performance payment amounts are decided by the board following the end of year. Performance and termination payments are included in the above table based on the relevant period in which the decision was made to make the payment.

Judi Zielke, Tom Munyard, Elanor Huntington and David Williams held their respective positions for part of the financial year.

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3.2 (b) Senior Executive Staff Remuneration

Senior Executive Staff Remuneration		Short Term Benefits			Post Employment Benefits	Other Long Term Benefits			
Remuneration Band	Number of Senior Executive Staff	Average Base Salary $	Average salary at risk payments $	Average Other Benefits and Allowances $	Average Super-annuation Contributions $	Average Long Service Leave $	Average Other Long Term Benefits $	Average Termination Benefits $	Average Total Remuneration $
$0 - $220,000	5	81,069	11,756	7,972	13,510	2,340	-	39,387	156,034
$270,001 - $295,000	2	219,038	9,954	20,559	36,882	3,613	-	-	290,046
$320,001 - $345,000	1	243,833	20,584	24,870	44,614	949	-	-	334,850
$345,001 - $370,000	2	286,267	21,421	24,870	31,150	855	-	-	364,563
$370,001 - $395,000	2	314,265	10,145	21,684	30,050	3,877	-	-	380,021
$395,001 - $420,000	3	297,553	17,991	16,535	45,889	19,639	-	-	397,607
$420,001 - $445,000	2	320,311	24,217	23,911	34,406	11,182	-	19,175	433,202
$470,001 - $495,000	1	343,781	21,024	24,870	56,139	34,131	-	-	479,945
$545,001 - $570,000	1	472,974	20,021	24,870	23,859	6,150	-	-	547,874

Base salary includes annual leave accrued in the period.

During the reporting period ended 30 June 2022, CSIRO had nineteen executives who meet the definition of senior executive staff. This note has been prepared on an accrual basis for substantive and long term acting senior management personnel during the period. Base Salary includes annual leave accrued in the period.

Performance payment amounts represent amounts paid based on the contract amount allowable. Actual performance payments are decided by the Board following the end of financial year. Performance and termination payments are included in the above table based on the relevant period in which the decision was made to make the payment.

3.2. (c) Remuneration of highly paid staff

Remuneration of other highly paid staff		Short Term Benefits			Post Employment	Other Long Term Benefits			
Remuneration Band	Number of Highly Paid Staff	Average Base Salary $	Average salary at risk payments $	Average Other Benefits and Allowances $	Average Super-annuation Contributions $	Average Long Service Leave $	Average Other Long Term Benefits $	Average Termination Benefits $	Average Total Remuneration $
$235,000 - $245,000	28	183,069	3,536	13,495	30,319	(894)	-	9,812	239,337
$245,001 - $270,000	41	184,766	5,765	18,980	31,621	(2,573)	-	19,518	258,077
$270,001 - $295,000	22	189,893	8,137	16,186	31,901	(2,510)	-	38,803	282,410
$295,001 - $320,000	8	234,818	16,063	18,206	33,577	351	-	-	303,015
$320,001 - $345,000	8	216,648	14,051	24,692	37,013	(5,483)	-	44,941	331,862
$345,001 - $370,000	4	315,046	-	7,486	32,324	5,737	-	-	360,593
$370,001 - $395,000	6	309,307	10,682	18,043	38,604	2,615	-	-	379,251
$420,001 - $445,000	2	139,992	6,600	272,935	16,039	3,189	-	-	438,755
$445,001 - $470,000	1	97,633	27,419	-	28,661	(26,691)	-	318,860	445,882

Base salary includes annual leave accrued in the period.

Performance payment amounts represent amounts paid based on the contract amount allowable. Actual performance payments are decided by the Board following the end of financial year. Performance and termination payments are included in the above table based on the relevant period in which the decision was made to make the payment.

3.3. Remuneration of Board Members

		Short Term Benefits		Post employment benefits	
Board member	Term	Base Salary $	Other benefits and allowances $	Super Contributions $	Total 2021-22 Remuneration $
Michele Allan	Reappointed 05.05.19 - 04.05.24	**72,884**	**13,890**	**8,688**	**95,462**
Drew Clarke	Appointed 24.08.17 - 23.08.22	**72,884**	**8,165**	**8,114**	**89,163**
Edwina Cornish	Reappointed 26.11.20 - 25.11.23	**72,884**	**8,165**	**8,114**	**89,163**
Kathryn Fagg (Chair)	Appointed 15.10.21 - 14.10.26	**125,521**	**4,693**	**13,039**	**143,253**
David Knox	Reappointed 05.05.19 - 04.05.24	**72,884**	**12,008**	**8,499**	**93,391**
Ian Macfarlane	Appointed 15.10.21 - 14.10.24	**52,638**	**-**	**5,272**	**57,910**
Peter Riddles	Reappointed 24.04.17 - 23.04.22	**58,794**	**16,385**	**7,518**	**82,697**
David Thodey (Chair)	Reappointed 15.10.20 - 14.10.21	**41,031**	**-**	**9,826**	**50,857**
Michelle Simmons	Appointed 17.09.20 - 16.09.25	**72,883**	**-**	**9,429**	**82,312**
Total remuneration for CSIRO Board Members		**642,403**	**63,306**	**78,499**	**784,208**
Board Members (Chile Fundacion)					
Claudia Bobadilla	Appointed 15.03.17 - 15.03.22	**31,019**	**-**	**-**	**31,019**
Maria Del Rosario Navarro	Appointed 13.09.19 - 13.09.24	**31,019**	**-**	**-**	**31,019**
Total remuneration for Board Members (Chile Fundacion)		**62,038**	**-**	**-**	**62,038**
Total Consolidated Remuneration for CSIRO Group		**704,441**	**63,306**	**78,499**	**846,246**

The remuneration of the Chief Executive, who is also a CSIRO Board Member is reported under Note 3.2 Key Management Personnel Remuneration. Kathryn Fagg who was appointed to the Board as Deputy Chair on 02.08.18, was appointed Chair on 15.10.21, taking over the position from David Thodey.

3.4. Related Party Disclosures

(a) Controlled Entities

The Science and Industry Endowment Fund ('SIEF') was established under the *Science and Industry Endowment Act 1926*. The principal activity of the SIEF Trust is to provide assistance to persons engaged in scientific research and in training of students in scientific research. The SIEF Trustee is the CSIRO Chief Executive and SIEF is a wholly controlled entity. The SIEF's separate financial statements are reported in the CSIRO Annual Report.

Chile Research Fundación ('Fundación') was established in October 2013. The Fundación is a controlled entity governed by a Board in accordance with the Constitution of the Fundación. The Fundación is working with industry and leading Chilean Universities to develop cutting-edge technologies to reduce the environmental impact of mining and increase productivity.

National ICT Australia ('NICTA') is Australia's ICT Research Centre of Excellence and undertakes internationally recognised research in partnership with industry, government and researchers to create national benefit and wealth for Australia. NICTA is the parent entity of NICTA IPR Pty Ltd and a small number of minor proprietary limited companies that exist to hold intellectual property and commercialise research. CSIRO obtained full control of NICTA on 28 August 2015, when the members of the NICTA Board resolved to adopt a revised company constitution which provided CSIRO with effective control over NICTA.

CSIRO has established an Innovation Fund with Commonwealth funding support to invest in the development of early stage technology opportunities from the public research sector, to increase their translation into commercial opportunities to be taken up by Australian industry. The Fund has been established through a structure of entities whose purpose is to manage and operate the Fund.

The entities that comprise the Innovation Fund are:

- CSIRO Innovation Fund 1, LP is an incorporated limited partnership formed under the *Partnership Act 1892 (NSW)*. It is registered by Industry Innovation and Science Australia as an Early Stage Venture Capital Limited Partnership (ESVCLP). It was established in January 2017.
- CSIRO Management Partnership, LP is an incorporated limited partnership formed under the *Partnership Act 1892 (NSW)*. It was established in January 2017 as a Venture Capital Management Partnership and acts as the general partner of the CSIRO Innovation Fund 1, LP.
- CSIRO General Partner 2 Pty Ltd was established in December 2016 and is a small proprietary company limited by shares, which are solely held by CSIRO. This company acts as the general partner of CSIRO Management Partnership, LP.
- CSIRO Fund of Funds, LP is an incorporated limited partnership formed under the *Partnership Act 1892 (NSW)* and is registered by Industry Innovation and Science Australia as an Australian Venture Capital Fund of Funds. It was established in May 2016 and its limited partner is CSIRO. The Fund is also a limited partner of CSIRO Innovation Fund 1, LP.
- CSIRO Innovation Holding Trust is a trust established in July 2018. Its sole Member is CSIRO and it is also a Member of the CSIRO Innovation Follow-On Fund 1.
- CSIRO General Partner Pty Ltd was established in May 2016 and is a small proprietary company limited by shares, which are solely held by CSIRO. It acts as the general partner of CSIRO Fund of Funds LP and is also the trustee of CSIRO Innovation Holding Trust. CSIRO General Partner Pty Ltd does not earn any income in the course of its business, as a result, it relies on CSIRO to pay any reasonable expenses it incurs including, audit and regulatory expenses.
- CSIRO Financial Services Pty Ltd was established in December 2015 and is a small proprietary company limited by shares, which are solely held by CSIRO. The company has been issued an Australian Financial Services License by ASIC and acts as Manager of CSIRO Innovation Fund 1, LP.
- CSIRO Follow-On Services Pty Ltd was established in April 2018 and is a small proprietary company limited by shares, which are solely held by CSIRO. It serves as trustee of the CSIRO Innovation Follow-On Fund 1.
- CSIRO Innovation Follow-On Fund 1 was established October 2018 and is structured as a managed investment trust, formed to provide follow-on investment to companies supported by CSIRO Innovation Fund 1, LP.

- CSIRO Innovation Services Pty Ltd was established in October 2016 and is a small proprietary company limited by shares, which are solely held by CSIRO. It acts as trustee of a discretionary trust established to distribute some returns from CSIRO Innovation Fund 1, LP, and as trustee of a unit trust established to distribute some returns form CSIRO Innovation Follow-On Fund 1.
- CSIRO Innovation Fund Discretionary Trust was established in January 2017 to hold and distribute some of the returns from CSIRO Innovation Fund 1, LP according to an agreed distribution policy administered by CSIRO Innovation Services Pty Ltd.
- CSIRO Follow-On Sponsor Trust was established in June 2019 for the purpose of distributing carried interest from the CSIRO Innovation Follow-On Fund 1.
- CSIRO Innovation Fund 2, LP is an incorporated limited partnership formed under the *Partnership Act 1892* (NSW). It is registered by Industry Innovation and Science Australia as an Early Stage Venture Capital Limited Partnership (ESVCLP). It was established in March 2020.
- CSIRO Management Partnership 2, LP is an incorporated limited partnership formed under the *Partnership Act 1892 (NSW)*. It was established in March 2020 as a Venture Capital Management Partnership and acts as the general partner of the CSIRO Innovation Fund 2, LP.
- CSIROGP Fund 2 Pty Ltd was established in March 2020 and is a small proprietary company limited by shares, which are solely held by CSIRO. This company acts as the general partner of CSIRO Management Partnership Pty 2, LP.
- CSIRO Follow-On Services 2 Pty Ltd was established in March 2020 and is a small proprietary company limited by shares, which are solely held by CSIRO. It will serve as the trustee of CSIRO Innovation Follow-On Fund 2, which is yet to be established and will be set up as a managed investment trust.
- CSIRO Custodial Services Pty Ltd was established in April 2020 for the purpose of providing custodial services under an Australian Financial Services Licence to the Innovation Fund entities.
- CSIRO Innovation Follow-on Fund 2 was established November 2021 and is structured as a managed investment trust, formed to provide follow-on investment to companies supported by CSIRO Innovation Fund 1, LP and CSIRO Innovation Fund 2, LP.
- CSIRO Innovation Coinvestment Services Pty Ltd was established in September 2021 and is a small proprietary company limited by shares, which are solely held by CSIRO. It serves as the trustee of CSIRO Innovation Coinvestment Fund.
- CSIRO Innovation Coinvestment Fund was established March 2022 and is structured as an attribution managed investment trust, formed to invest with CSIRO Innovation Follow-on Fund 2 and to provide follow-on investment to companies supported by CSIRO Innovation Fund 1, LP and CSIRO Innovation Fund 2, LP.

All of the above Innovation Fund related companies are under the sole control of the CSIRO as at 30 June 2022. The above entities (with the exception of CSIRO Financial Services Pty Ltd; CSIRO Innovation Services Pty Ltd; and CSIRO Custodial Services Pty Ltd) sit outside the General Government Sector.

CSIRO USA LLC and CSIRO Innovations LLC were established in February 2017 to support the establishment of a CSIRO presence in the United States. Both entities are incorporated within Delaware and are wholly controlled by the CSIRO.

(b) Related party relationships

CSIRO is an Australian Government controlled entity. Related parties to CSIRO are the Board, Key Management Personnel including the Portfolio Minister and Executive, and other Australian Government entities.

Transactions with related parties:

Given the breadth of Government activities, related parties may transact with the government sector in the same capacity as ordinary citizens. Such transactions include the payment or refund of taxes, receipt of a Medicare rebate or higher education loans. These transactions have not been separately disclosed in this note.

Significant transactions with related parties can include the payments of grants or loans, purchases of goods and services, asset purchases, sales transfers or leases, debts forgiven and guarantees. Giving consideration to relationships with related entities, and transactions entered into during the reporting period by CSIRO, it has been determined that there are no related party transactions to be separately disclosed.

4. Managing Uncertainties

This section analyses how CSIRO manages financial risk within its operating environment.

4.1. Contingent Assets and Liabilities

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Quantifiable Contingencies				
Contingent assets				
Insurance claims	**16,329**	26,044	**16,329**	26,044
Bank guarantees received from suppliers	**10,223**	5,405	**10,223**	5,405
Total contingent assets	**26,552**	31,449	**26,552**	31,449
Contingent liabilities				
Estimated legal claims	**2,301**	-	**2,301**	-
Total contingent liabilities	**2,301**	-	**2,301**	-
Total net contingent asset/(liability)	**24,251**	31,449	**24,251**	31,449

At 30 June 2022, CSIRO has an outstanding insurance claim for business interruption and costs incurred from a natural disaster (hailstorm) that occurred at CSIRO Black Mountain on 20 January 2020. At the end of the period, this claim has been partially settled by a $9.94m payment received, leaving a balance of $15.07m of the total contingent asset of $16.33m.

Depending on the materiality of risks involved with certain commercial transactions, CSIRO has requested bank guarantees where necessary to mitigate risks, notably where substantial advance payments were made.

CSIRO is currently involved in commercial discussions relating to expired property lease arrangements.

Unquantifiable contingencies

As disclosed in the Overview Note, a financial provision for the estimated costs in restoring and decontaminating land where a legal or constructive obligation has arisen has been recognised on the Statement of Financial Position. For cases where there is no legal or constructive obligation, the potential costs have not been assessed and are unquantifiable contingencies. CSIRO has no other identified unquantifiable contingencies to report.

Accounting Policy

Contingent liabilities and contingent assets are not recognised in the Statement of Financial Position but reported in the notes. They may arise from uncertainty as to the existence of a liability or asset, or represent a liability or asset in respect of which the amount cannot be reliably measured. Contingent assets are disclosed when settlement is probable but not virtually certain and contingent liabilities are disclosed when settlement is greater than remote.

4.2. Financial Instruments

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 4.2A: Categories of financial instruments				
Financial Assets				
Financial assets at fair value through profit or loss				
Other investments	**796,818**	477,903	**267,995**	214,650
Total financial assets at fair value through profit and loss	**796,818**	477,903	**267,995**	214,650
Financial assets at amortised cost				
Cash at bank	**204,701**	298,586	**128,105**	211,872
Term deposits	**476,900**	239,050	**410,750**	192,000
Receivable for goods and services	**97,514**	80,712	**96,003**	77,123
Other receivables	**1,120**	3,924	**2,406**	3,444
Total financial assets at amortised cost	**780,235**	622,272	**637,264**	484,439
Total financial assets	**1,577,053**	1,100,175	**905,259**	699,089
Financial Liabilities				
Financial liabilities measured at amortised cost				
Trade creditors	**311,032**	218,014	**310,036**	213,989
Other creditors	**18,357**	16,034	**18,097**	15,716
Deposits	**18,897**	21,800	**19,729**	23,469
Total financial liabilities at amortised cost	**348,286**	255,848	**347,862**	253,174
Total financial liabilities	**348,286**	255,848	**347,862**	253,174
Note 4.2B: Net gains or losses on financial assets				
Financial assets at amortised cost				
Interest revenue	**3,623**	3,425	**2,881**	2,755
Impairment expense	**(245)**	(906)	**(245)**	(906)
Net gain from financial assets at amortised cost	**3,378**	2,519	**2,636**	1,849
Investments assets at fair value through profit or loss				
Fair value changes	**191,563**	119,961	**35,909**	19,905
Net gain/(loss) from investment assets at fair value through profit or loss	**191,563**	119,961	**35,909**	19,905
Net gain/(loss) on financial assets	**194,941**	122,480	**38,545**	21,754
Note 4.2C: Net gains or losses on financial liabilities				
Financial liabilities measured at amortised cost				
Interest expense	**1,506**	2,308	**1,438**	2,273
Net loss from financial liabilities	**1,506**	2,308	**1,438**	2,273

Accounting Policy

Financial Assets

The Group classifies its financial assets under AASB 9 *Financial Instruments* in the following categories:

a) financial assets at fair value through profit or loss;

b) financial assets at fair value through other comprehensive income; and

c) financial assets measured at amortised cost.

The classification depends on both the entity's business model for managing the financial assets and contractual cash flow characteristics at the time of initial recognition. Financial assets are recognised when the Group becomes a party to the contract and, as a consequence, has a legal right to receive or a legal obligation to pay cash and derecognised when the contractual rights to the cash flows from the financial asset expire or are transferred upon trade date.

Financial Assets at Amortised Cost

Financial assets included in this category need to meet two criteria:

1. the financial asset is held in order to collect the contractual cash flows; and

2. the cash flows are solely payments of principal and interest (SPPI) on the principal outstanding amount.

Amortised cost is determined using the effective interest method.

Effective Interest Method

Income is recognised on an effective interest rate basis for financial assets that are recognised at amortised cost.

Financial Assets at Fair Value Through Other Comprehensive Income (FVOCI)

Financial assets measured at fair value through other comprehensive income are held with the objective of both collecting contractual cash flows and selling the financial assets and the cash flows meet the SPPI test. Any gains or losses as a result of fair value measurement or the recognition of an impairment loss allowance is recognised in other comprehensive income.

Financial Assets at Fair Value Through Profit or Loss (FVTPL)

Financial assets are classified as financial assets at fair value through profit or loss where the financial assets either don't meet the criteria of financial assets held at amortised cost or at FVOCI (i.e. mandatorily held at FVTPL) or may be designated. Financial assets at FVTPL are stated at fair value, with any resultant gain or loss recognised in profit or loss. The net gain or loss recognised in profit or loss incorporates any interest earned on the financial asset. CSIRO values it's equity investment portfolio in listed companies, unlisted companies and in Uniseed Trust as FVTPL. CSIRO Innovation Fund values it's equity investment portfolio in unlisted companies as FVTPL.

Impairment of Financial Assets

Financial assets at amoritised cost are assessed for impairment at the end of each reporting period based on Expected Credit Losses, using the general approach which measures the loss allowance based on an amount equal to lifetime expected credit losses where risk has significantly increased, or an amount equal to 12-month expected credit losses if risk has not increased.

The simplified approach for trade, contract and lease receivables is used. This approach always measures the loss allowance as the amount equal to the lifetime expected credit losses. A write-off constitutes a de-recognition event where the write off directly reduces the gross carrying amount of the financial asset.

Financial liabilities

Financial liabilities are classified as either financial liabilities 'at fair value through profit or loss' or financial liabilities at amoritised cost. Financial liabilities are recognised and derecognised upon 'trade date'.

Financial Liabilities at Fair Value Through Profit or Loss

Financial liabilities at fair value through profit or loss are initially measured at fair value. Subsequent fair value adjustments are recognised in profit or loss. The net gain or loss recognised in profit or loss incorporates any interest paid on the financial liability.

Financial Liabilities at Amortised Cost

Financial liabilities at amortised cost, are initially measured at fair value, net of transaction costs. These liabilities are subsequently measured at amortised cost using the effective interest method, with interest expense recognised on an effective interest basis.

Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

4.3. Fair Value Measurement

Note 4.3A: Fair value measurement

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Financial assets				
Other investments	**796,818**	477,903	**267,995**	214,650
Total financial assets	**796,818**	477,903	**267,995**	214,650
Non-financial assets				
Land	**415,857**	411,686	**415,857**	411,686
Buildings	**1,165,585**	1,206,722	**1,165,396**	1,206,026
Plant and equipment	**563,542**	540,596	**563,505**	540,452
Investment properties	**50,747**	49,016	**50,747**	49,016
Heritage and cultural	**9,952**	9,952	**9,952**	9,952
Total non-financial assets	**2,205,683**	2,217,972	**2,205,457**	2,217,132
Financial liabilities				
Lease liabilities	**63,653**	81,016	**63,529**	80,293
Deposits	**18,897**	21,800	**19,729**	23,469
Total financial liabilities	**82,550**	102,816	**83,258**	103,762

Land and Buildings includes assets held for sale.

Accounting Judgements and Estimates

In the process of applying the accounting policies listed in this note, CSIRO has made the following judgements that have the most significant impact on the amounts recorded in the financial statements:

- The fair value of land which will continue to be used to further the Group's objectives for research activities, and buildings held for specialised purposes and where there is no readily available market price has been taken to be Fair Value- Highest and Best Use (level 3 inputs), as determined by an independent valuer;
- The fair value of plant and equipment has been taken to be Fair Value – Highest and Best Use (level 2 and 3 inputs) as they mainly comprise of specialised research equipment. Fair value is determined by an independent valuer; and
- The fair value of listed companies is assessed at market value (level 1 inputs); whereas unlisted companies and commercial vehicles are assessed at fair value using the best information available (level 3 inputs). For investments in unlisted companies where there is no readily available market pricing, the fair value has been determined by applying valuation techniques in line with the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation Guidelines (IPEV).' Where recent transactions for the unlisted companies' equity have taken place, these equity transaction prices are used to value CSIRO's investment. For unlisted companies that have not had any recent equity transactions, other IPEV valuation techniques are used such as discounted cash flows and share of net assets. Investments in special purpose entities are either valued at cost of share of net realisable assets since a reliable estimate of fair value cannot be established. These entities have been set up primarily to gain access to research facilities/networks, or to provide services to owners. Hence, there is not 'active market' for these equity investments.

No accounting assumptions and estimates have been identified that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next reporting period.

5. Other information

5.1. Current/non-current distinction for assets and liabilities

	Consolidated		CSIRO	
	2022	2021	**2022**	2021
	$'000	$'000	**$'000**	$'000
Note 5.1A: Current/non-current distinction for assets and liabilities				
Assets expected to be recovered in:				
No more than 12 months				
Cash and cash equivalents	**681,601**	537,636	**538,855**	403,872
Trade and other receivables	**103,756**	88,974	**103,698**	85,206
Assets held for sale	**40,530**	5,200	**40,530**	5,200
Total no more than 12 months	**825,887**	631,810	**683,083**	494,278
More than 12 months				
Other non-financial assets	**11,886**	12,416	**11,644**	12,371
Land and buildings	**1,540,912**	1,618,408	**1,540,723**	1,617,712
Heritage and cultural	**9,952**	9,952	**9,952**	9,952
Plant and equipment	**563,542**	540,596	**563,505**	540,452
Investment properties	**50,748**	49,016	**50,748**	49,016
Intangibles	**18,502**	19,716	**18,502**	19,716
Inventories	**1,290**	1,315	**1,290**	1,315
Other investments	**796,818**	477,903	**267,995**	214,650
Total more than 12 months	**2,993,650**	2,729,322	**2,464,359**	2,465,184
Total assets	**3,819,537**	3,361,132	**3,147,442**	2,959,462
Liabilities expected to be settled in:				
No more than 12 months				
Suppliers	**311,032**	218,014	**310,036**	213,989
Other payables	**18,357**	16,034	**18,097**	15,716
Leases	**11,214**	24,642	**11,214**	24,065
Employee provisions	**63,645**	75,988	**63,474**	75,847
Provision for remediation	**179**	17,690	**179**	17,715
Deposits	**2,140**	5,389	**3,087**	6,906
Total no more than 12 months	**406,567**	357,757	**406,087**	354,238
More than 12 months				
Leases	**52,439**	56,374	**52,315**	56,228
Employee provisions	**162,807**	188,712	**162,716**	188,636
Provision for remediation	**65,187**	45,086	**65,187**	45,061
Deposits	**16,757**	16,411	**16,642**	16,563
Total more than 12 months	**297,190**	306,583	**296,860**	306,488
Total liabilities	**703,757**	664,340	**702,947**	660,726

5.2. Monies Held in Trust

	2022 $'000	2021 $'000
Monies held in trust represented by cash, deposits and investments for the benefit of the Group which are not included in the Statement of Financial Position are:		
The Sir Ian McLennan Achievement for Industry Award - established to award outstanding contributions by the Group's scientists and engineers to national development.	**399**	437
The Elwood and Hannah Zimmerman Trust Fund - established to fund weevil research and the curation of the Australian National Insect Collection (ANIC) weevil collection.	**4,629**	5,021
The Schlinger Trust - established to research the taxonomy, biosystematics, general biology and biogeography of Australasian Diptera conducted by the Australian National Insect Collection.	**3,040**	2,377
Total monies held in trust as at 30 June	**8,068**	7,835

Summary of movements:	**McLennan $'000**	**Zimmerman $'000**	**Schlinger $'000**	**Total $'000**
Balance as at 1 July 2021	**437**	**5,021**	**2,377**	**7,835**
Interest and distribution adjustments	**(13)**	**-**	**800**	**787**
Expenditure in the period	**(25)**	**(392)**	**(137)**	**(554)**
Balance as at 30 June 2022	**399**	**4,629**	**3,040**	**8,068**

5.3. Collections

CSIRO is the custodian of several collections used for scientific research. These collections have been established over time and document an extensive range of Australian flora and fauna species. The collections are irreplaceable, bear scientific and historical value and are not reliably measurable in monetary terms. Therefore, CSIRO has not recognised them as an asset in its financial statements.

The main collections held by CSIRO are:

- Australian National Herbarium (ANH) – With a focus on the Australian flora and that of neighbouring regions such as New Guinea and the Pacific, the ANH has over 1 million herbarium specimens, with additional holdings at the Australian Tropical Herbarium (ATH) in Cairns, Queensland. The ANH collections include the Dadswell Memorial Wood Collection and comprehensive holdings of a number of groups, including cryptogams, eucalypts and orchids.

- Australian National Insect Collection (ANIC) – Specialising in Australian terrestrial invertebrates, ANIC houses over 12 million specimens and is the world's largest collection of Australian insects, as well as groups such as mites, spiders, earthworms, nematodes and centipedes. ANIC is an important research collection used by CSIRO researchers, university staff, and students, and scientists from Australian and international research organisations.

- Australian National Wildlife Collection (ANWC) – Specialising in terrestrial vertebrates, ANWC contains specimens of most species of Australian mammals, birds, reptiles, and amphibians. It is particularly rich in specimens of birds from New Guinea. ANWC is a valuable asset for biologists engaged in biodiversity research. Its research library holds 60,000 recordings of wildlife sounds, more than a thousand tissue samples, and egg collections from more than 300 bird species.

- Australian National Fish Collection (ANFC) – Specialising in marine fishes, the ANFC contains almost 150,000 specimens representing more than 3,000 species from the Indo-Pacific region. It is an invaluable resource for biodiversity and biogeographic research on Australian and Indo-Pacific fishes. Its major strengths are sharks, rays, and deep-water fishes. It also contains a large collection of images and radiographs of Australian fishes.

- Australian Tree Seed Centre (ATSC) – The ATSC is managed as a collection and research centre for Australian native tree species. For over 50 years the centre has been collecting, researching and supplying quality, fully documented tree seed to both domestic and overseas customers. Collections of seed are sourced from wild populations and genetically improved seed from our domestication and improvement programs.

- Australian National Algae Culture Collection (ANACC) – The ANACC consists of more than 300 microalgae species and is a resource for research on algal diversity, distribution, richness, and taxonomic relationships, including those of economic importance and environmental concern. Aligned with the collection is the National Algae Supply Service, which provides microalgae strains as starter cultures to industry, research organisations and educational institutions in over 70 countries.

6. Budgetary Reports and Explanations of Major Variances

The following provides a comparison of the original budget as presented in the 2021-22 Portfolio Budget Statements to the actual outcome reported for 2021-22. The intention of this variance analysis is to provide the reader with information relevant to assessing the performance of CSIRO, including the accountability for the resources entrusted to it.

Statement of Comprehensive Income
for the period ended 30 June 2022

	Actual	Consolidated Original Budget	Variance
	2022	**2022**	2022
	$'000	**$'000**	$'000
NET COST OF SERVICES			
Expenses			
Employee benefits	**753,506**	**800,884**	47,378
Suppliers	**436,370**	**461,872**	25,502
Depreciation and amortisation	**173,984**	**183,990**	10,006
Finance costs	**1,506**	**3,315**	1,809
Write-downs and impairment loss on financial instruments	**245**	**-**	(245)
Write-downs and impairment of other assets	**10,590**	**500**	(10,090)
Losses from asset sales	**-**	**-**	-
Total expenses	**1,376,201**	**1,450,561**	74,360
Own-Source Income			
Own-source revenue			
Revenue from contracts with customers	**470,485**	**383,825**	86,660
Royalties and licence fees	**-**	**38,945**	(38,945)
Bank and term deposits interest	**3,623**	**4,421**	(798)
Rental income	**6,850**	**6,300**	550
Other revenues	**14,715**	**31,960**	(17,245)
Total own-source revenue	**495,673**	**465,451**	30,222
Gains			
Gains from sale of equity investments and intellectual property	**409**	**-**	409
Gains from asset sales	**113**	**-**	113
Gains on valuation of equity investments	**191,563**	**-**	191,563
Gain on revaluation of investment properties	**1,731**		1,731
Other gains	**17,847**	**-**	17,847
Foreign exchange gains	**292**	**-**	292
Total gains	**211,955**	**-**	211,955
Total own-source income	**707,628**	**465,451**	242,177
Net cost of services	**(668,573)**	**(985,110)**	316,537
Revenue from Government	**949,037**	**946,001**	3,036
Surplus/(Deficit)	**280,464**	**(39,109)**	319,573
OTHER COMPREHENSIVE INCOME			
Items not subject to subsequent reclassification to net cost of services			
Changes in asset revaluation reserves	**22,781**	**-**	22,781
Items subject to subsequent reclassification to net cost of services			
Changes in other reserves	**(11)**	**-**	(11)
Total other comprehensive income	**22,770**	**-**	22,770
Total comprehensive income/(loss)	**303,234**	**(39,109)**	342,343

Statement of Financial Position
as at 30 June 2022

	Actual	Consolidated Original Budget	Variance
	2022	**2022**	**2022**
	$'000	**$'000**	**$'000**
ASSETS			
Financial Assets			
Cash and cash equivalents	**681,601**	**382,136**	299,465
Trade and other receivables	**103,756**	**88,503**	15,253
Other investments	**796,818**	**204,854**	591,964
Total financial assets	**1,582,175**	**675,493**	906,682
Non-Financial Assets			
Land and buildings	**1,540,912**	**1,544,946**	(4,034)
Heritage and cultural	**9,952**	**4,463**	5,489
Plant and equipment	**563,542**	**527,522**	36,020
Intangibles	**18,502**	**16,248**	2,254
Investment properties	**50,747**	**49,373**	1,374
Inventories	**1,290**	**1,420**	(130)
Other non-financial assets	**11,886**	**18,748**	(6,862)
Total non-financial assets	**2,196,831**	**2,162,720**	34,111
Assets held for sale	**40,530**	**-**	40,530
Total assets	**3,819,536**	**2,838,213**	981,323
LIABILITIES			
Payables			
Suppliers	**311,032**	**211,496**	(99,536)
Other payables	**18,357**	**18,760**	403
Deposits	**18,897**	**22,508**	3,611
Total payables	**348,286**	**252,764**	(95,522)
Interest Bearing Liabilities			
Leases	**63,653**	**63,286**	(367)
Total Interest bearing liabilities	**63,653**	**63,286**	(367)
Provisions			
Employee provisions	**226,452**	**270,976**	44,524
Provision for remediation	**65,366**	**28,288**	(37,078)
Total provisions	**291,818**	**299,264**	7,446
Total liabilities	**703,757**	**615,314**	(88,443)
Net assets	**3,115,779**	**2,222,899**	892,880
EQUITY			
Contributed equity	**331,384**	**331,384**	-
Asset revaluation reserves	**1,595,506**	**1,522,989**	72,517
Other reserves	**(300)**	**-**	(300)
Retained surplus	**764,975**	**368,526**	396,449
Non-controlling interest	**424,214**	**-**	424,214
Total equity	**3,115,779**	**2,222,899**	892,880

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Statement of Changes in Equity

for the period ended 30 June 2022

	Retained earnings			Asset revaluation reserve			Other reserves			Contributed equity/capital			Non-controlling interest			Total equity		
	Actual	Original Budget	Variance	Actual	Original Budget	Variance	Actual	Original Budget	Variance	Actual	Original Budget	Variance	Actual	Original Budget	Variance	Actual	Original Budget	Variance
	2022	**2022**	2022	**2022**	**2022**	2022	**2022**	**2022**	2022	**2022**	**2022**	2022	**2022**	**2022**	2022	**2022**	**2022**	2022
	$'000	**$'000**	$'000	**$'000**	**$'000**	$'000	**$'000**	**$'000**	$'000	**$'000**	**$'000**	$'000	**$'000**	**$'000**	$'000	**$'000**	**$'000**	$'000
Opening balance	**582,925**	407,635	175,290	**1,572,725**	1,523,229	49,496	**(259)**	(240)	(19)	**327,384**	327,384	-	**214,017**	-	214,017	**2,696,792**	2,258,008	438,784
Comprehensive income																		
Other comprehensive income	**-**	-	-	**22,781**	-	22,781	**(11)**	-	(11)	**-**	-	-	**-**	**-**	-	**22,770**	-	22,770
Surplus/(deficit) for the period	**182,050**	(39,109)	221,159	**-**	-	-	**-**	-	-	**-**	-	-	**98,414**	**-**	98,414	**280,464**	(39,109)	319,573
Total comprehensive income	**182,050**	(39,109)	221,159	**22,781**	-	22,781	**(11)**	-	(11)	**-**	-	-	**98,414**		98,414	**303,234**	(39,109)	342,343
Other Movements	**-**	-	-	**-**	-	-	**(30)**	-	(30)	**-**	-	-	**-**	**-**	-	**(30)**	-	(30)
Contributions by owners																		
Equity injection	**-**	-	-	**-**	-	-	**-**	-	-	**4,000**	4,000	-	**111,783**	**-**	111,783	**115,783**	4,000	111,783
Closing balance	**764,975**	368,526	396,449	**1,595,506**	1,523,229	72,277	**(300)**	(240)	(60)	**331,384**	331,384	-	**424,214**	**-**	424,214	**3,115,779**	2,222,899	892,880

CONSOLIDATED FINANCIAL STATEMENTS
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS

Cash Flow Statement

for the period ended 30 June 2022

	Consolidated		
		Original	
	Actual	Budget	Variance
	2022	2022	2022
	$'000	$'000	$'000
OPERATING ACTIVITIES			
Cash received			
Receipts from Government	**949,037**	**946,001**	3,036
Sale of goods and rendering of services	**582,312**	**511,543**	70,769
Interest	**2,774**	**4,534**	(1,760)
Net GST received	**17,653**	**-**	17,653
Total cash received	**1,551,776**	**1,462,078**	89,698
Cash used			
Employees	**789,093**	**796,813**	7,720
Suppliers	**457,262**	**507,979**	50,717
Interest payments on lease liabilities	**1,381**	**3,315**	1,934
Finance costs	**125**	-	(125)
Deposits	**2,903**	-	(2,903)
Net GST paid	**48**	**4,326**	4,278
Other	**-**	**3,000**	3,000
Total cash used	**1,250,812**	**1,315,433**	64,621
Net cash from operating activities	**300,964**	**146,645**	154,319
INVESTING ACTIVITIES			
Cash received			
Proceeds from sales of property, plant and equipment	**1,405**	**44,100**	(42,695)
Proceeds from sales of equity investments and intellectual property	**442**	**-**	442
Total cash received	**1,847**	**44,100**	(42,253)
Cash used			
Purchase of property, plant and equipment	**130,381**	**162,221**	31,840
Purchase of equity investments	**126,845**	**4,000**	(122,845)
Other selling costs	**40**	**-**	(40)
Total cash used	**257,266**	**166,221**	(91,045)
Net cash used in investing activities	**(255,419)**	**(122,121)**	(133,298)
FINANCING ACTIVITIES			
Cash received			
Contributed equity	**115,783**	**4,000**	111,783
Total cash received	**115,783**	**4,000**	111,783
Cash used			
Principal payments of lease liabilities	**17,363**	**27,310**	9,947
Total cash used	**17,363**	**27,310**	9,947
Net cash from financing activities	**98,420**	**(23,310)**	121,730
Net increase in cash held	**143,965**	**1,214**	142,751
Cash and cash equivalents at the beginning of the reporting period	**537,636**	**380,922**	156,714
Cash and cash equivalents at the end of the reporting period	**681,601**	**382,136**	299,465

CONSOLIDATED FINANCIAL STATEMENTS
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS

Explanation of Major Variances

Australian Accounting Standard AASB *1055 Budgetary Reporting* requires variance explanations of major variances between the original budget, as presented in the 2021-22 Portfolio Budget Statements, and the actual outcome as reported in these financial statements. Major variances are those that are relevant to an assessment of the discharge of accountability and to an analysis of the performance of the entity.

Variances attributable to factors which would not reasonably have been identifiable at the time of the budget preparation, such as the revaluation, sale or impairment of assets have not been included as part of the explanation.

Statement of Comprehensive Income

Royalties and licence fees are disclosed separately in the Portfolio Budget Statements (PBS) and included in *Revenue from contracts with customers* as per AASB 15 *Revenue from Contracts with Customers* in the financial statements.

Other revenue is lower, and *Payables* are higher, than budget due to higher than expected contract liabilities where consideration has been received from the customer, but services are yet to the performed.

Statement of Financial Position

Cash and cash equivalents are higher than budget due to the difference in basis of preparation between the PBS and the financial statements relating to the Innovation Fund investment. The Portfolio Budget Statements are prepared on the basis of only including General Government Sector (GGS) entities, whereas the Financial Statements for CSIRO include the results of CSIRO and all controlled entities, regardless of whether they are within the GGS or not. Therefore, there is a difference in the accounting treatment between the two, resulting in the budget containing the Innovation Fund investment as an *Investment Accounted for using the Equity Method* (reported as Other investments), while the Financial Statements account for this investment in the consolidation as *Cash and cash equivalents* held by a controlled entity. Additionally, *Cash and cash equivalents* are higher than budget due to a higher opening balance than estimated and resulting from COVID-19 implications, there was lower employee and supplier expenses and capital expenditure.

Other investments are higher than budget due to an increase in the valuation of the share portfolio, and the difference in basis of preparation between the PBS and the financial statements relating to the Innovation Fund investment.

Australian Government bond rate movements during the year impacted the net present value of leave liabilities and resulted in a decrease to *Employee provisions*.

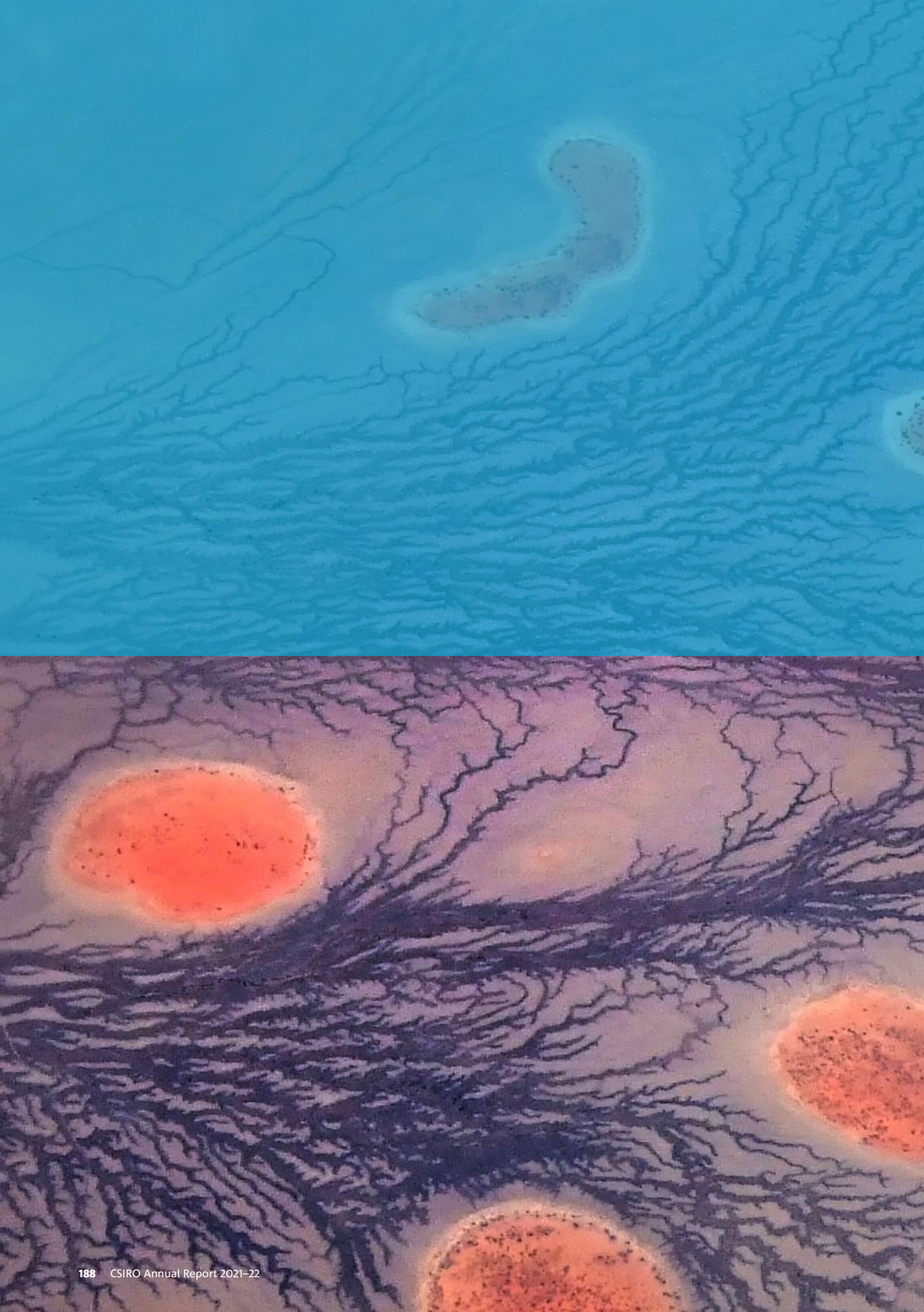
Provision for remediation is higher than budget reflecting higher than previously estimated waste removal and site remediation costs.

Retained Surplus is higher than budget as the operating result for 2021-22 was positive in comparison to the budgeted loss.

The *Non-controlling interest* balance is higher than budget due to the difference in basis of preparation between the PBS and the financial statements relating to the Innovation Fund investment.

Cash Flow Statement

Variances relating to cash flows reflect the factors detailed under Statement of Comprehensive Income and Statement of Financial Position.



Part 6

Science and Industry Endowment Fund

Trustee's report

As Australians face challenges like the rising cost of food and ongoing supply chain disruptions from the global pandemic, I'm proud that the Science and Industry Endowment Fund (SIEF) continues to invest in truly collaborative research projects and infrastructure that solve exactly these problems, as well as many others. This year's report shows SIEF is delivering on its purpose to support research that assists Australian industries and communities and delivers on national priorities.

Strengthening Australian agriculture

Australia has a proud history of innovation in agriculture, developing technology that addresses the needs of Australian farmers and the nation. SIEF is supporting innovation in Australian agriculture through several digital transformation and sustainable farming practices, including the Genomics Initiative, the Boorowa Agricultural Research Station and TranspiratiONal.

Artificial Intelligence (AI) is unlocking new ways to do science, like accelerating analysis of large data sets. The NICTA gift-funded Genomics Initiative is applying AI and other technologies to wheat, barley and oat crops to improve productivity and resilience. The Initiative is strengthening understanding of crop genome data and deploying AI to automate the detection and quantification of crop traits, such as germination, spikes, height and biomass, to monitor plant growth and estimate yield. CSIRO is collaborating with Australian cereal breeding company InterGrain on this research. Read more about the Genomics Initiative on page 195.

CSIRO is investing in 'labs of the future' that bring together all the latest technologies in one experimental space to deliver next-generation equipment that enables cutting-edge research.

The SIEF-supported CSIRO Boorowa Agricultural Research Station in New South Wales features the latest digital agricultural technologies, such as remote and non-destructive crop monitoring and a cutting-edge sensor network recording key physical and environment characters over time to improve the productivity, profitability and sustainability of Australian farms.

The new ACDP TEM provides additional capability of cryo-TEM imaging and greater depth of 3D imaging that builds on the existing diagnostic TEM capability and will contribute to the understanding of virus/host interaction and viral mechanisms for disease that may contribute to treatment and prevention of serious viral diseases such as Rabies.

This XAg P30 spray drone with capacity of 16 litres is being used to apply different chemical and bio-fungicidal treatments to cropping trials at the Boorowa Agricultural Research Station.

It is the only modern established field research station in Australia where the potential of new technologies can be explored, demonstrated to customers and improved upon. New drone imaging technologies, including RGB, multispectral, hyperspectral and thermal imaging, are being deployed to improve resolution in assessment of canopy and plant health and disease and plant stress characteristics, giving a better understanding of variability in plant health and leading to better breeding outcomes and improved crop varieties for the farming industry.

Environmental sustainability is critical for agricultural productivity and economic viability. The cost of weeds to Australian agricultural industries is estimated to be greater than $5 billion per year, plastic waste is a significant global environmental issue and limited water supplies must be carefully managed. CSIRO collaborated with farmers and an Australian polymer manufacturer in a SIEF Experimental Development Program project to further develop and assess a new environmentally friendly alternative to plastic mulch film called TranspiratiONal, which contributes to a reduction of plastic waste on farms while suppressing weeds and retaining moisture in the soil. The ease and control in applying the non-toxic, water-based sprayable biodegradable mulch makes it suitable for use in home gardens, horticulture, orchard crops and forestry, with prospects for application in broadacre farming. This project is also a graduate of CSIRO's recently expanded ON program, which supports researchers turn their ideas into products. Read more about TranspiratiONal on page 194.

Sovereign research infrastructure

COVID-19 and global conflicts have disrupted the international supply chains Australia relies on in the absence of strong sovereign manufacturing capabilities, as well as exposing Australia to increased risk from biological and cyber security threats. One of SIEF's Special Purposes is Landmark Research Infrastructure, comprising the creation or development of nationally significant facilities for the conduct of research-enhancing capability and capacity, and for encouraging collaboration – national, international and with industry. The Medium Equipment Program has delivered $9.8 million of SIEF funding towards infrastructure projects that facilitate the creation of new industries in Australia, with co-investment of $13.7 million by collaborators.

Adding to the suite of national research infrastructure that CSIRO manages for the nation, the CSIRO Biologics Facility in Melbourne has been designed and constructed for manufacture of investigational biological products under principles of Good Manufacturing Practice. The facility will be used by Australian academic and industry partners to develop new pharmaceuticals and address an unmet demand for local production and testing of new products to Australian standards. To meet the future needs of Australian researchers, the facility has also been designed in accordance with the requirements of the United States Federal Drug Administration and European Medicines Agency, providing Australian access to global clinical trial opportunities and a faster path towards a broader range of markets. The facility has already been deployed in 2 science projects to manufacture vaccine supplies for Phase I clinical trials.

The Cybersecurity Virtual Laboratory in Melbourne is developing and testing cutting-edge AI-driven automated solutions to secure and protect cyber systems from attack. This addresses 2 key vulnerabilities for Australia: the ever-increasing number of cyber-attacks (estimated to cost the Australian economy $17 billion per year) and Australia's cybersecurity skill shortage. Australian small and medium enterprises (SMEs) are most at risk due to their size and lack of access to cybersecurity professionals. This project is building autonomic cybersecurity capabilities and undertaking collaborative research between CSIRO, universities and industries that will generate software-as-a-service solutions that can help to close the skills gaps and protect Australian businesses.

Australia's biosecurity capability has been boosted with SIEF's investment in a new transmission electron microscope at the Australian Centre for Disease Preparedness in Geelong. This is a unique capability among Australian laboratories as it provides a non-reagent based 'open view' platform for the rapid morphologic identification of infectious agents, a capability essential for Australia's and the Asia-Pacific region's biosecurity. It is located in a lower physical containment laboratory to create easier access in the secure facility for the research community, enabling longer term collaborations with university partners, state animal health laboratories, international collaborators and Microscopy Australia partners.

Evaluating SIEF's performance

Two reviews of SIEF have been delivered this year, both finding that the Fund is continuing to meet its objectives and operating effectively.

Swinburne University analysed the breadth and quality of research funded by the CSIRO Gift as well as its outcomes. The review concluded SIEF invested in an appropriately wide area of Australian research priorities with high quality research and ambitious goals. It found SIEF filled a gap in the national innovation system by supporting large-scale and collaborative research and infrastructure projects. A summary of the review can be found on the SIEF website.[1]

A review of the John Stocker Postgraduate Scholarships and Postdoctoral Fellowships found they provided significant opportunities for early career researchers and a boost for the Australian innovation system. The John Stocker program is part of the SIEF Special Purpose Promotion of Science. The review found it offered a point of difference to other fellowships and scholarship programs through its focus on non-technical training and collaborative and industry-focused projects. A summary of the review can be found on the SIEF website.[2]

1 www.sief.org.au/about-sief/reports/outcomes-and-impact-of-the-csiro-gift/
2 www.sief.org.au/about-sief/reports/john-stocker-postgraduate-scholarships-and-postdoctoral-fellowships-review/

Thanks to Advisory Councils and Expert Panels

As Trustee, I have been greatly assisted by the Fund's Advisory Councils and I thank each and every member for their contribution. These bodies have supported the Fund and provide constant guidance and insight on a pro bono basis. I am deeply grateful to these supporters of the Fund, both personally and on behalf of Australian science and innovation. I also thank the many reviewers who generously give their time and expertise to assess applications for funding, particularly the industrial expert reviewers for the Experimental Development Program. This spirit of generosity and goodwill in the Australian science and industry community creates the dedicated and thriving innovation landscape that SIEF is proud to support.

Dr Larry Marshall

SIEF Trustee

SIEF advisory bodies

CSIRO Gift Advisory Council Members

Emeritus Prof Alan Robson (Chair) AO
Dr Peter Riddles AM (Chair, EDP Review Panels)
Mr Nigel Poole
Dr Ezio Rizzardo AC
Professor Margaret Sheil AO
Professor Tom Spurling AM

Generation STEM Consultative Council

Mr David Wright (Chair)
Ms Chloe Read
Ms Gail Fulton
Dr Ian Oppermann
Dr Dave Williams*
Ms Gabrielle Trainor AO
Professor Elanor Huntington

NICTA Program Advisory Council

Ms Michelle Price
Dr Jon Whittle
Mr John Paitaridis

*Indicates retirement from the Councils.

TranspiratiONal

Challenge

Feeding and clothing the world sustainably are pressing challenges in today's world. There is a need for solutions to feed a global population of 10 billion and meet a greater than 50 per cent increase in food demand by 2050. This underlines the need for higher efficiency options that can help maximise the use of limited supplies of water, minimise waste generation and require fewer agrochemicals.

Petroleum-based preformed Plastic Mulch Films (PMFs) are commonly used to reduce soil evaporation and suppress weeds to improve agricultural efficiency. However, these are proving to be a major source of pollution as well as contributing to the global plastic waste problem and thereby imposing high lifetime costs to society, the environment and the economy. The effects of climate change amidst increasing environmental degradation and pollution have further exacerbated this issue.

Response

CSIRO has developed a polyurethane-based Sprayable Biodegradable Polymer Membrane Technology (SBPM Technology) called TranspiratiONal-SBM. These 'spray and walk away' water-based formulations applied to the soil surface help improve crop water productivity and control competing weed growth. The field trials have demonstrated the ability of the product to deliver greater yields and decrease waste, thereby improving farm profitability. The sprayable mulch typically biodegrades naturally in 5 to 7 months with the help of the soil microbiome without leaving any environmental damage. The polymer membrane offers the ease of application with regular farm equipment such as handheld sprayers or large mechanised sprayers.

SIEF's role

The SIEF supported TranspiratiONal during 2016–18, through the Experimental Development Program (EDP) to advance the Technology Readiness Level (TRL) of SBPM technology. SIEF's support allowed CSIRO to demonstrate the in-field biodegradability, non-toxicity and commercially attractive performance of the technology. It also helped prove the high-scale manufacturability of the formulations and provided CSIRO scientists with valuable experience in the farm-scale application of the SBM.

Impact

The successful development and uptake of sprayable biodegradable mulch formulations is a global opportunity to serve the world's US$4 billion per year agricultural mulch film market while addressing the food security challenge. The shifting regulatory trends to limit plastic waste and consumer preferences for eco-friendly products are expected to drive market adoption. Once the technology is economically viable, there is potential to provide sustainable farming solutions and improve crop yields with no/low environmental footprint for just about every cropping system across the world. Successful uptake of formulations is expected to create new services, products, experiences and market niches in Australia as well as open new export opportunities, especially in the Asia Pacific.

Tomato crop at Rochester VIC with SBM more than one month after application.

Genomics Digital Initiative

Challenge

Traditional breeding programs are long-term processes. Genomic breeding programs can significantly improve the efficiency of this process by using the fundamental relationship between a species' genetic blueprint (i.e. genome) and its observed characteristics (i.e. phenotype). This requires 'omics data integration, which is capturing an analysis of high-resolution, multi-dimensional genomic, transcriptomic, and proteomic data and phenotype profiling.

Phenotype profiling is the capturing of large amounts of population-wide and environmentally diverse data, in order to extract useful correlations. Globally, the industry is hampered by reliance on unrepresentative and/or piecemeal genomic data, lack of integration between different 'omics layers, and time-consuming, resource-intensive and inaccurate collection of phenotypic data.

Response

SIEF supported the Genomics Digital Initiative to respond to a well-defined need for next-generation tools and platforms that allow the exploitation of genomics-phenomics data to facilitate genomic breeding strategies that were delivered through 2 programs.

Pan'omics Toolbox delivered a suite of tools to support the integration and analysis of datasets comprising data from multiple 'omic layers and individuals. The work focused on the development of an efficient method to capture micro and macro-scale commonality and variation within genomic data, and was validated using real-world, gigabase-scale genomic (DNA) and transcriptomic (RNA) datasets for species such as wheat and cattle.

Video Phenomics delivered an Artificial Intelligence (AI)-based prototype phenotyping platform by utilising advanced computer vision and machine learning methods to improve the automatic collection of crop traits for plant growth monitoring, quantification, and yield prediction applications. The work focused on enabling the efficient and accurate capture of phenomics data for wheat, barley and oats using low-cost sensors mounted on drones and ground vehicles, and through the utilisation of augmented reality (AR).

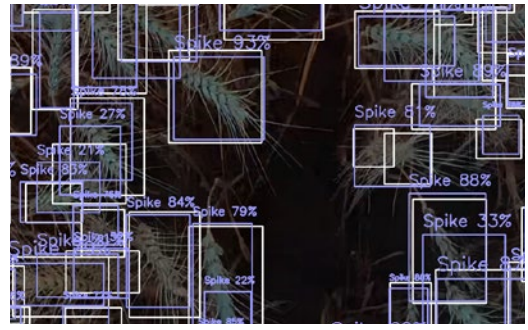
SIEF's role

SIEF's investment in the Genomics Digital Initiative was instrumental in helping lay the scientific groundwork to develop technologies and software platforms that aim to improve productivity, profitability, and sustainability of Australian crop industries through transforming the traditional crop breeding processes and farming practices. The support helped provide a significant basis to support further scientific and financial interventions as well as collaboration decisions for the future development of the tools and platforms.

Impact

The Genomics Digital Initiative has potential to deliver triple bottom line impacts from improving crop varieties, lowering the environmental footprint of agricultural activities and providing solutions to threats to global food security. This effort has the potential to contribute towards the vision to achieve $100 billion in farm gate outputs by 2030.

The impact is likely to eventuate first in the Australian agriculture sector through enabling efficient and precise breeding strategies capable of exploiting attractive crop varieties much more effectively than previously possible. The successful development and adoption of tools and platforms have the potential to provide a competitive edge to produce profitable niche crops. Industries associated with human health, such as medtech, pharmaceuticals and precision medicine development, are likely to follow as future end-users for this technology.



AI-based wheat spike detection. The detected spikes are shown in purple bounding boxes while the ground-truth spikes are displayed in white bounding boxes.

INDEPENDENT AUDITOR'S REPORT

To the Minister for Industry and Science

Opinion

In my opinion, the financial statements of the Science and Industry Endowment Fund (SIEF) for the year ended 30 June 2022:

(a) comply with Australian Accounting Standards – Simplified Disclosures and the Science and Industry Endowment Act 1926; and

(b) present fairly the financial position of the SIEF as at 30 June 2022 and its financial performance and cash flows for the year then ended.

The financial statements of the SIEF, which I have audited, comprise the following as at 30 June 2022 and for the year then ended:

- Statement of Comprehensive Income;
- Statement of Financial Position;
- Statement of Changes in Equity;
- Cash Flow Statement;
- Notes to and forming part of the financial report, comprising a summary of significant accounting policies and other explanatory information; and
- Statement by the Trustee and Chief Finance Officer.

Basis for opinion

I conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. My responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of my report. I am independent of the SIEF in accordance with the relevant ethical requirements for financial statement audits conducted by the Auditor-General and his delegates. These include the relevant independence requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants (including Independence Standards)* (the Code) to the extent that they are not in conflict with the *Auditor-General Act 1997*. I have also fulfilled my other responsibilities in accordance with the Code. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Trustee's responsibility for the financial statements

The Trustee of SIEF is responsible under the Science and Industry Endowment Act 1926 for the preparation and fair presentation of annual financial statements that comply with Australian Accounting Standards – Simplified Disclosures and the rules made under the Act. The Trustee is also responsible for such internal control as the Trustee determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Trustee is responsible for assessing the ability of SIEF to continue as a going concern, taking into account whether SIEF's operations will cease as a result of an administrative restructure or for any other reason. The Trustee is also responsible for disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the assessment indicates that it is not appropriate.

GPO Box 707, Canberra ACT 2601
38 Sydney Avenue, Forrest ACT 2603
Phone (02) 6203 7300

Auditor's responsibilities for the audit of the financial statements

My objective is to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian National Audit Office Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the financial statements.

As part of an audit in accordance with the Australian National Audit Office Auditing Standards, I exercise professional judgement and maintain professional scepticism throughout the audit. I also:

- identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control;
- obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the SIEF's internal control;
- evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Accountable Authority;
- conclude on the appropriateness of the Accountable Authority's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the SIEF's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify my opinion. My conclusions are based on the audit evidence obtained up to the date of my auditor's report. However, future events or conditions may cause the SIEF's to cease to continue as a going concern; and
- evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

I communicate with the Trustee regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

Australian National Audit Office

Bola Oyetunji

Group Executive Director

Delegate of the Auditor General

Canberra

6 September 2022

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT BY THE TRUSTEE AND CHIEF FINANCE OFFICER
For the year ended 30 June 2022

STATEMENT BY THE TRUSTEE AND CHIEF FINANCE OFFICER OF COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION (CSIRO) AS SERVICE PROVIDER TO THE SCIENCE AND INDUSTRY ENDOWMENT FUND

The attached financial report for the year ended 30 June 2022 has been prepared based on properly maintained financial records and in accordance with Australian Accounting Standards simplified disclosure requirements and the requirements of the Science and Industry Endowment Act 1926, and present fairly the financial position of the Science and Industry Endowment Fund as at 30 June 2022 and its performance and cashflows for the year then ended.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Science and Industry Endowment Fund will be able to pay its debts as and when they become due and payable.

Larry Marshall

Trustee of the Science and Industry Endowment Fund

6 September 2022

Louise Coutts

Chief Finance Officer (Acting) of CSIRO as service provider to the Science and Industry Endowment Fund

6 September 2022

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF COMPREHENSIVE INCOME
For the year ended 30 June 2022

	Notes	2022	2021
		$	$
EXPENSES			
Scientific research grants	2	**6,069,145**	5,008,502
Service fee under services agreement with CSIRO		**593,500**	544,000
Audit fees		**11,500**	15,500
Other fees		**6,001**	56,931
Total expenses		**6,680,146**	5,624,933
REVENUE			
Gifts	3	**18,000,000**	18,000,000
Interest	4	**484,525**	548,880
Total revenue		**18,484,525**	18,548,880
Net profit		**11,804,379**	12,923,947
Other comprehensive income		-	-
Total comprehensive income		**11,804,379**	12,923,947

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF FINANCIAL POSITION
As at 30 June 2022

	Notes	2022	2021
		$	$
ASSETS			
Current assets			
Cash and cash equivalents	5	**89,373,110**	77,698,752
Trade and other receivables	6	**408,622**	278,601
Total assets		**89,781,732**	77,977,353
LIABILITIES			
Current liabilities			
Payables			
Suppliers payable		**-**	-
Total payables		**-**	**-**
Total liabilities		**-**	-
Net assets		**89,781,732**	77,977,353
EQUITY			
Contributed equity		**200,000**	200,000
Retained surplus		**89,581,732**	77,777,353
Total equity		**89,781,732**	77,977,353

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
STATEMENT OF CHANGES IN EQUITY
For the year ended 30 June 2022

	Retained Surplus		Contributed Equity		Total Equity	
	2022	2021	**2022**	2021	**2022**	2021
	$	$	**$**	$	**$**	$
Opening Balance	**77,777,353**	64,853,406	**200,000**	200,000	**77,977,353**	65,053,406
Net profit/(deficit)	**11,804,379**	12,923,947	**-**	-	**11,804,379**	12,923,947
Closing Balance	**89,581,732**	77,777,353	**200,000**	200,000	**89,781,732**	77,977,353

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
CASH FLOW STATEMENT
For the year ended 30 June 2022

	Notes	2022	2021
		$	$
OPERATING ACTIVITIES			
Cash received			
CSIRO Gift		**18,000,000**	18,000,000
Interest received		**453,414**	807,312
GST credits received		**569,105**	492,033
Total cash received		**19,022,519**	19,299,345
Cash used			
Payments to grantees		**6,676,060**	5,509,352
Other payments		**672,101**	695,124
Total cash used		**7,348,161**	6,204,476
Net cash provided by operating activities		**11,674,358**	13,094,869
Net increase in cash held		**11,674,358**	13,094,869
Cash at the beginning of the reporting period		**77,698,752**	64,603,883
Cash at the end of the reporting period		**89,373,110**	77,698,752

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND
NOTES TO AND FORMING PART OF THE FINANCIAL REPORT
For the year ended 30 June 2022

Note 1 Overview

The Science and Industry Endowment Fund (referred to as "the Fund") was established under the *Science and Industry Endowment Act 1926* with the Trustee of the Fund being the Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Chief Executive and is a not-for-profit entity. An appropriation of 100,000 pounds was received at the time the Fund was established. The principal activity of the Fund is to provide assistance to persons engaged in scientific research and in the training of students in scientific research. The total cash payments made by the Fund in 2021-22 under the Original Endowment were $18,000 (GST exclusive).

In October 2009 the Minister for Innovation, Industry, Science and Research announced a gift of $150 million to be donated by CSIRO to the Fund. The gift is intended to be used for scientific research for the purposes of assisting Australian industry and furthering the interests of the Australian community or contributing to the achievement of Australian national objectives. The gift was made subject to the terms of a Deed of Gift between the Trustee and CSIRO dated 15 October 2009. During the 2018 to 2021 and 2022 financial years, CSIRO made further gifts totalling $33 million and $18 million respectively to the Fund. These gifts were also made subject to the terms of the Deed of Gift between the Trustee and CSIRO dated 15 October 2009. The total cash payments made by the Fund in 2021-22 under the Deed of Gift were $2,377,249 (GST exclusive).

In June 2017, the NSW Government acting through the NSW Department of Industry provided a $25 million endowment to the Fund to create the NSW Generation STEM Program. The program will be delivered over a 10-year period and will implement activities including research, to increase the supply of Science, Technology, Engineering and Mathematics (STEM) skilled labour to meet the current and future needs of New South Wales. The total cash payments made by the Fund in 2021-22 under the NSW Endowment were $2,520,000 (GST exclusive).

In November and December 2018, National ICT Australia Limited (NICTA), a controlled entity of CSIRO, provided two gifts to the Fund in the total amount of $20 million to fund the Future National ICT Industry Platform Program. A further $5 million was provided to the Fund by NICTA in December 2019. The program is to support research activities and projects at a scale that address challenges in the field of Information and Communications Technology (ICT) and it is intended that the outcomes from the Program will benefit Australia by helping create new Australian technology-based industries and/or applied technology platforms that can reach a global scale. The total payments made by the Fund in 2021-22 under the Future National ICT Industry Platform Program were $1,764,897 (GST exclusive).

In one financial year a maximum amount of $25 million exclusive of Goods and Services Tax (GST) can be disbursed from the Fund for the CSIRO GIFT Programs, NSW Generation STEM Program and the Future National ICT Industry Platform Program (under the Deeds of Gift/Endowment). The total payments made by the Fund under these gifts and programs in 2021-22 were $6,662,146 (GST exclusive). This includes Scientific Research Grant payments, Service, audit and other fees.

Basis of Preparation of the Financial Statements
The financial statements for the Fund are general purpose financial statements and are required by:

- Section 10 of the *Science and Industry Endowment Act 1926.*

The financial statements have been prepared in accordance with:

- Australian Accounting Standards and Interpretations – including AASB 1060 *General Purpose Financial Statements – Simplified Disclosures for For-Profit and Not-for Profit Entities* issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

The financial statements have been prepared on an accrual basis and are in accordance with the historical cost convention. No allowance is made for the effect of changing prices on the results or the financial position. The

Note 1 Overview (continued)

financial statements are presented in Australian dollars and values are rounded to the nearest dollar unless otherwise specified.

Key Judgements and Estimates
The accounting policies are set out below. Within the current financial year, there were no significant Judgements or estimates used in the preparation of the financial statements.

New Australian Accounting Standards
All new, revised and/or amending standards and/or interpretations that were issued prior to the signing of these financial statements and are applicable to the current reporting period did not have a material effect on the Fund's financial statements.

Standard/Interpretation	Nature of change in accounting policy, transitional provisions, and adjustment to financial statements
AASB 1060 *General Purpose Financial Statements – Simplified Disclosures for For-Profit and Not-for Profit Tier 2 Entities*	AASB 1060 applies to annual reporting periods beginning on or after 1 July 2021 and replaces the reduced disclosure requirements (RDR) framework. The application of AASB 1060 involved some reduction in disclosure compared to the RDR with no impact on the reported financial position, financial performance and cash flows of the entity.

Future Australian Accounting Standard Requirements
No new or revised pronouncements were issued prior to the finalisation of the financial statements by the Australian Accounting Standards Board which are expected to have a material financial impact on the Fund in future reporting periods.

Taxation
The Fund is exempt from all forms of taxation except Goods and Services Tax ('GST').

Events after the Reporting Period
At the time of signing of the financial statements, the Trustee is not aware of any other significant events occurring after the reporting date that could impact on the financial report.

SCIENCE AND INDUSTRY ENDOWMENT FUND
NOTES TO AND FORMING PART OF THE FINANCIAL REPORT
For the year ended 30 June 2022

Note 2 Scientific Research Grants

	2022	2021
	$	$
Education and Outreach Program	**18,000**	-
Future National ICT Industry Platform Program	**1,494,897**	2,288,094
Research Infrastructure Program	**185,000**	200,000
Special Research Program	**160,000**	-
Promotion of Science Program - Scholarships and Fellowships	**100,000**	100,000
Experimental Development Program	**1,686,248**	2,220,408
NSW Endowment Grant	**2,425,000**	200,000
Total	**6,069,145**	5,008,502

Accounting Policy
The Fund awards grants to support approved eligible applications and activities in instalments, subject to the completion by Grant Recipients of funding milestones which are verified through provision of satisfactory Progress Reports to the Fund Manager. All costs associated with providing Scientific Research Grants are expensed at acceptance of relevant Progress Report.

SCIENCE AND INDUSTRY ENDOWMENT FUND
NOTES TO AND FORMING PART OF THE FINANCIAL REPORT
For the year ended 30 June 2022

Note 3 Revenue from Gifts

	2022	2021
	$	$
CSIRO Gift	**18,000,000**	18,000,000
Total	**18,000,000**	18,000,000

Accounting Policy
Gifts are recognised as income when the entity gains control of the funds, where the consideration to acquire an asset is significantly less than fair value. Gifts, bequests or donations receivable are recognised at their nominal amounts as a financial asset under AASB 9 *Financial Instruments* as highlighted in paragraph 8 of AASB 1058 *Income of Not-for-Profit Entities*.

The additional $18 million gift received from CSIRO in 2021-22 is to be used to further Fund objectives (2020-21 $18m).

Note 4 Interest Revenue

	2022	2021
	$	$
Cash bank account interest	**95,859**	61,998
Term deposits interest	**388,666**	486,882
Total	**484,525**	548,880

Accounting Policy
Interest revenue is recognised using the effective interest method as set out in AASB 9 *Financial Instruments.*

Note 5 Cash and Cash Equivalents

	2022	2021
	$	$
Cash at bank	**23,223,110**	30,648,752
Term deposits	**66,150,000**	47,050,000
Total	**89,373,110**	77,698,752

Accounting Policy
Cash and cash equivalents include cash on hand and demand deposits in bank accounts with an original maturity of twelve months or less that are readily convertible to known amounts of cash and subject to insignificant risk of change in value. Cash is recognised at its nominal amount.

SCIENCE AND INDUSTRY ENDOWMENT FUND
NOTES TO AND FORMING PART OF THE FINANCIAL REPORT
For the year ended 30 June 2022

Note 6 Trade and Other Receivables

	2022	2021
	$	$
Interest receivable	**200,868**	169,757
GST receivable	**207,754**	108,844
Total receivables	**408,622**	278,601
Less impairment loss allowance	**-**	-
Total trade and other receivables	**408,622**	278,601

Accounting Policy
Trade and other receivables are financial assets held for collecting the contractual cash flows of the asset, where the cash flows are solely payments of principal and interest that are not provided at below-market interest rates. They are subsequently measured at amortised cost using the effective interest method adjusted for any loss allowance.

Note 7 Contingent Assets and Liabilities

No contingent assets or liabilities existed as at 30 June 2022 (2021: nil).

Note 8 Related Party Disclosures

The Fund is a wholly controlled subsidiary of CSIRO. The Trustee is the Chief Executive of CSIRO who is remunerated through CSIRO and not paid an additional salary for his role as Trustee of the Fund. There were no transactions during the reporting period between the Trustee and the Fund. Related parties to this entity other than the Trustee are other Australian Government entities.

In considering relationships with related entities and transactions entered into during the reporting period by the Fund, it has been determined that there are no related party transactions required to be separately disclosed. Grant funds are administered and applied in accordance with Program Funding Agreements. Awarded grants are assessed against a set of established criteria prior to approval. All eligible applications are assessed equally.

SCIENCE AND INDUSTRY ENDOWMENT FUND
NOTES TO AND FORMING PART OF THE FINANCIAL REPORT
For the year ended 30 June 2022

Note 9 Schedule of Commitments

The below table shows the monies the Fund is committed to pay on its executed grant funding agreements as at 30 June 2022, subject to grantees meeting funding milestones.

	2022	2021
	$	$
BY TYPE		
Grants commitments payable	**35,644,442**	31,724,140
GST receivable on grants payable	**(3,240,404)**	(2,884,013)
Total net commitments by type	**32,404,038**	28,840,127
BY MATURITY		
Grant commitments payable		
One year or less	**5,703,894**	8,453,552
From one to five years	**26,035,548**	15,240,588
More than five years	**3,905,000**	8,030,000
Total grants payable	**35,644,442**	31,724,140
GST commitments receivable		
One year or less	**(518,536)**	(768,505)
From one to five years	**(2,366,868)**	(1,385,508)
More than five years	**(355,000)**	(730,000)
Total commitments receivable	**(3,240,404)**	(2,884,013)
Net commitments by maturity	**32,404,038**	28,840,127

Note 10 Financial Instruments of the Financial Statements

Note 10.1 Categories of Financial Instruments

	2022	2021
	$	$
Categories of financial instruments		
Financial assets		
Cash and cash equivalents	**89,373,110**	77,698,752
Trade and Other Receivables	**408,622**	278,601
Total financial assets at amortised cost	**89,781,732**	77,977,353
Total financial assets	**89,781,732**	77,977,353

Note 10.1 Categories of Financial Instruments (continued)

Accounting Policy

Financial Assets

The Fund classifies its financial assets under AASB 9 *Financial Instruments* as financial assets measured at amortised cost.

The classification depends on both the entity's business model for managing the financial assets and contractual cash flow characteristics at the time of initial recognition. Financial assets are recognised when the entity becomes a party to the contract and, as a consequence, has a legal right to receive or a legal obligation to pay cash and derecognised when the contractual rights to the cash flows from the financial asset expire or are transferred upon trade date.

Financial Assets at Amortised Cost

Financial assets included in this category need to meet two criteria:

1. the financial asset is held in order to collect the contractual cash flows; and

2. the cash flows are solely payments of principal and interest (SPPI) on the principal outstanding amount.

Amortised cost is determined using the effective interest method.

Effective Interest Method

Income is recognised on an effective interest rate basis for financial assets that are recognised at amortised cost.

Financial liabilities

Financial liabilities are classified as either financial liabilities 'at fair value through profit or loss' or other financial liabilities. Financial liabilities are recognised and derecognised upon 'trade date'.

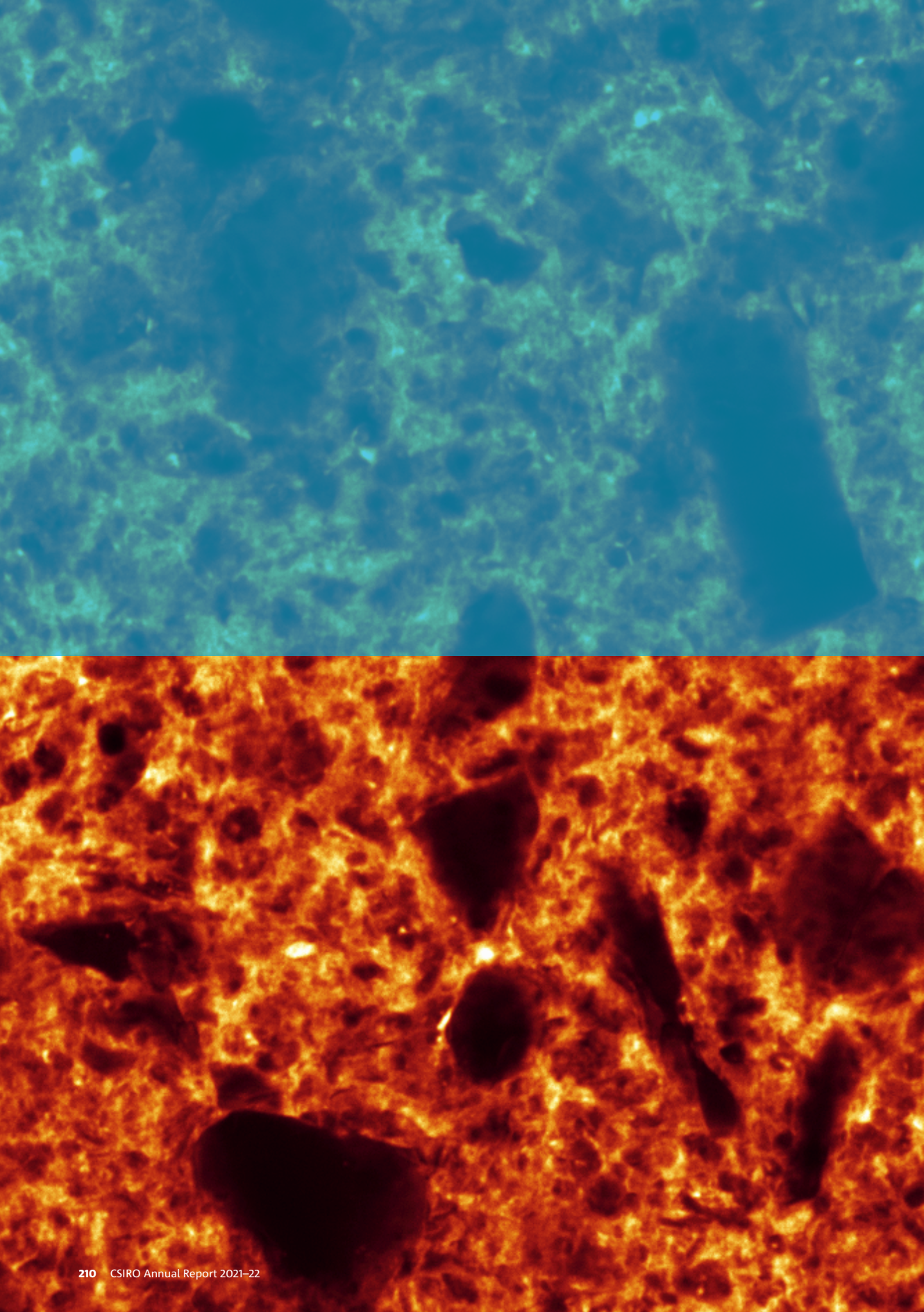
Financial Liabilities at Amortised Cost

Financial liabilities, including borrowings, are initially measured at fair value, net of transaction costs. These liabilities are subsequently measured at amortised cost using the effective interest method, with interest expense recognised on an effective interest basis.

Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

Note 10.2 Net Income and Expenses from Financial Assets

	2022	2021
	$	$
Interest revenue	**484,525**	548,880
Total	**484,525**	548,880



Part 7

Appendices and indexes

Data templates

Appendix A: Management of human resources

All ongoing employees current report period (2021–22)

	MALE			FEMALE			INDETERMINATE			TOTAL
	Full-time	Part-time	Total Male	Full-time	Part-time	Total Female	Full-time	Part-time	Total indeterminate	
NSW	373	10	383	175	65	240	–	–	–	623
QLD	366	10	376	254	64	318	1	–	1	695
SA	101	8	109	88	36	124	–	–	–	233
TAS	203	6	209	97	16	113	1	–	1	323
VIC	659	22	681	388	109	497	–	–	–	1,178
WA	254	8	262	92	40	132	1	–	1	395
ACT	426	20	446	294	90	384	–	–	–	830
NT	8	1	9	2	3	5	–	–	–	14
External territories	–	–	–	–	–	–	–	–	–	–
Overseas	–	–	–	–	–	–	–	–	–	–
Total	**2,390**	**85**	**2,475**	**1,390**	**423**	**1,813**	**3**	–	**3**	**4,291**

All non-ongoing employees current report period (2021–22)

	MALE			FEMALE			INDETERMINATE			TOTAL
	Full-time	Part-time	Total Male	Full-time	Part-time	Total Female	Full-time	Part-time	Total indeterminate	
NSW	104	19	123	71	26	97	2	–	2	222
QLD	124	32	156	105	38	143	1	–	1	300
SA	23		23	27	9	36	1	–	1	60
TAS	28	8	36	20	19	39	–	–	–	75
VIC	148	27	175	108	46	154	1	–	1	330
WA	59	6	65	47	20	67	–	–	–	132
ACT	93	30	123	78	45	123	1	–	1	247
NT	2		2	4	5	9		–	–	11
External territories	–	–	–	–	–	–	–	–	–	–
Overseas	1	–	1	3	–	3	–	–	–	4
Total	**582**	**122**	**704**	**463**	**208**	**671**	**6**	–	**6**	**1,381**

All ongoing employees previous report period (2020–21)

	MALE			FEMALE			INDETERMINATE			TOTAL
	Full-time	Part-time	Total Male	Full-time	Part-time	Total Female	Full-time	Part-time	Total indeterminate	
NSW	375	17	392	179	67	246	–	–	–	638
QLD	370	9	379	218	56	274	–	–	–	653
SA	101	5	106	86	33	119	–	–	–	225
TAS	195	6	201	93	21	114	–	–	–	315
VIC	657	22	679	372	115	487	1	–	1	1,167
WA	242	8	250	91	38	129	1	–	1	380
ACT	448	21	469	296	87	383	–	–	–	852
NT	7	1	8	4	3	7	–	–	–	15
External territories	–	–	–	–	–	–	–	–	–	–
Overseas	–	–	–	–	–	–	–	–	–	–
Total	**2,395**	**89**	**2,484**	**1,339**	**420**	**1,759**	**2**	–	**2**	**4,245**

All non-ongoing employees previous report period (2020–21)

	MALE			FEMALE			INDETERMINATE			TOTAL
	Full-time	Part-time	Total Male	Full-time	Part-time	Total Female	Full-time	Part-time	Total indeterminate	
NSW	95	14	109	50	26	76	2	–	2	187
QLD	99	23	122	61	21	82	2	–	2	206
SA	21	1	22	21	6	27	–	–	–	49
TAS	21	2	23	18	5	23	–	–	–	46
VIC	115	11	126	79	22	101	2	–	2	229
WA	45	6	51	36	10	46	–	–	–	97
ACT	70	11	81	52	20	72	–	–	–	153
NT	2	1	3	1	2	3	–	–	–	6
External territories	–	–	–	–	–	–	–	–	–	–
Overseas	1	–	1	2	–	2	–	–	–	3
Total	**469**	**69**	**538**	**320**	**112**	**432**	**6**	**–**	**6**	**976**

Appendix B: Accountable authority

Details of accountable authority during the current report period (2021–22)

NAME	QUALIFICATIONS OF THE ACCOUNTABLE AUTHORITY	EXPERIENCE OF THE ACCOUNTABLE AUTHORITY
Ms Kathryn Fagg AO	BE (Hons) Chem Eng and MCom (Hons) FTSE GAICD	Ms Fagg, an experienced company director and chair, senior executive and former engineer, was appointed Chair of CSIRO Board from 14 October 2021 for a 5-year term. Her current positions include non-executive Director of the National Australia Bank Ltd, Medibank Private Ltd and Djerriwarrh Investments Ltd, Chair of Breast Cancer Network Australia, Inaugural Chair of Watertrust Australia Ltd, as well as a Board Member of the Grattan Institute, The Myer Foundation and the Champions of Change Coalition.
Dr Larry Marshall	BSc (Hons) PhD FAIP FTSE FAICD	Dr Marshall is a scientist, technology innovator and business leader with over 25 years' experience in creating value and impact with science. He founded 6 successful companies in biotechnology, photonics, telecommunications and semiconductors in the United States, and has served on 20 boards of high-tech companies operating in the United States, Australia and China. He is a Fellow of the Australian Institute of Physics, the Australian Academy of Technology and Engineering, and the Australian Institute of Company Directors; and ex-officio member of the National Science and Technology Council.
Mr David Knox	BSc (Hons) Mech Eng MBA FIE Aust FTSE GAICD	Mr Knox is an experienced company director and executive with a background in oil and gas. His other positions include Chair of Snowy Hydro and Chair of The Australian Centre for Social Innovation and Micro X; a Director of Migration Council Australia, the Adelaide Festival Board and Redflow; and a member of the Royal Institution of Australia Council.
Dr Michele Allan	BAppSc MMgtTec MCommLaw DBA FAICD	Dr Allan is an experienced company director and board chair with significant skills and competencies in the university, private and public sectors and expertise in food and advanced manufacturing. She is the Chancellor of Charles Sturt University and Chair of the boards of Wine Australia, Food and Agribusiness Growth Centre and Defence CRC for Trusted Autonomous Systems. Dr Allan's current board positions include Smart Sat CRC,Food Agility CRC, MJ Chickens and Dairy Food Safety Victoria. She is also Chair of Advisory Council for Australian AgrFood Data Exchange and a member of the Steering Committee.
Mr Drew Clarke AO	PSM BAppSc (Surveying) MSc GAICD FTSE	Mr Clarke is an experienced public sector company director with extensive public policy experience from over 20 years in senior government. He was Secretary of the Department of Resources, Energy and Tourism, and Secretary of the Department of Communications. He is Chair of Australian Energy Market Operator Ltd, a Director of NBNCo, a member of the Australian Government's Low Emission Technology Investment Advisory Council and an ex officio member of the Australian Antarctic Science Council. He also chairs advisory groups relating to energy transition research and Antarctic science research.

		PERIOD AS THE ACCOUNTABLE AUTHORITY OR MEMBER WITHIN THE REPORTING PERIOD		
	POSITION TITLE/ POSITION HELD EXECUTIVE/NON-EXECUTIVE	COMMENCEMENT DATE	CESSATION DATE	NUMBER OF MEETINGS ACCOUNTABLE AUTHORITY ATTENDED
	Chair Non-executive	2 August 2018	13 October 2026	8 of 8 meetings
	Chief Executive Executive	1 January 2015	30 June 2023	8 of 8 meetings
	Deputy Chair Non-executive	5 May 2016	13 October 2025	8 of 8 meetings
	Member Non-executive	5 May 2016	4 May 2024	7 of 8 meetings
	Member Non-executive	24 August 2017	23 August 2022	8 of 8 meetings

NAME	QUALIFICATIONS OF THE ACCOUNTABLE AUTHORITY	EXPERIENCE OF THE ACCOUNTABLE AUTHORITY
Professor Edwina Cornish AO	BSc (Hons) PhD FTSE AICD	Professor Cornish is an experienced director with significant scientific and academic leadership and international business development expertise. She played a key role in building one of Australia's first biotechnology companies, Florigene Limited, which developed and successfully commercialised the world's first genetically modified flowers. She is a member of the Council of La Trobe University, a Director of Uniquest Pty Ltd, Ambassador of the Australian Sleep Foundation, and was previously Provost and Senior Vice-President of Monash University.
Hon Ian Macfarlane	FAICD	Mr Macfarlane is the Chief Executive of the Queensland Resources Council, a non-executive director of Woodside Petroleum and Chairman of the Innovative Manufacturing Co-operative Research Centre. He brings significant experience in public policy and deep understanding of the resources and energy, agribusiness, science and innovation, skills and training, and industry and manufacturing sectors.
Professor Tanya Monro AC	BSc (Hons) PhD FAA FTSE FOSA FAIP GAICD	Professor Monro is the Chief Defence Scientist. Her experience at senior levels in industry and educational institutions includes research in photonics focusing on sensing, lasers and new classes of optical fibres. Professor Monro is Science Patron of the National Youth Science Forum and a member of the South Australian Premier's Economic Advisory Council.
Professor Michelle Simmons AO	BSc Physics (Hons) BSc Chemistry (Hons) PhD FRS FAA FAAAS FTSE FInstP Dist FRNS	Professor Simmons is Director of the Centre of Excellence for Quantum Computation and Communication Technology at the University of New South Wales and Founder and Director of Silicon Quantum Computing. She pioneered new technologies to build electronic devices in silicon at the atomic scale. Professor Simmons, a Fellow of the Royal Society of London, has been recognised by the American Computer Museum as a pioneer in quantum computing and was awarded the US Feynman Prize in Nanotechnology. She is a member of the University Research Commercialisation Scheme Taskforce and National Intelligence Scientific Advisory Board.
Dr Peter Riddles AM	BSc (Hons) PhD Grad Dip Bus FAICD FRSA	Dr Riddles is an experienced company director and advisor to various international science organisations including in the United States and the United Kingdom. He has worked as a research scientist in molecular biology in the public sector, including CSIRO, on commercialisation and new venture creation and government policy development and strategy. His other roles include member of the Science and Industry Endowment Fund GIFT.
Mr David Thodey AO	BA FAICD	Mr Thodey is a business leader and company director focused on innovation, technology and digital, with over 30 years' experience, including as Chief Executive Officer (CEO) of Telstra and CEO of IBM Australia and New Zealand. His current positions include director of Ramsay Health Care and Chair of Tyro and Xero Limited. He was the Chair of the CSIRO Board until 14 October 2021.

		PERIOD AS THE ACCOUNTABLE AUTHORITY OR MEMBER WITHIN THE REPORTING PERIOD		
	POSITION TITLE/ POSITION HELD EXECUTIVE/NON-EXECUTIVE	COMMENCEMENT DATE	CESSATION DATE	NUMBER OF MEETINGS ACCOUNTABLE AUTHORITY ATTENDED
	Member Non-executive	26 November 2015	25 November 2023	8 of 8 meetings
	Member Non-executive	14 October 2021	13 October 2024	5 of 5 meetings
	Member Non-executive	25 February 2016	24 February 2024	7 of 8 meetings
	Member Non-executive	17 September 2020	16 September 2025	7 of 8 meetings
	Member Non-executive	24 April 2014	23 April 2022	7 of 7 meetings
	Chairman Non-executive	15 October 2015	14 October 2021	3 of 3 meetings

Appendix C: Audit Committee

MEMBER NAME	QUALIFICATIONS, KNOWLEDGE, SKILLS OR EXPERIENCE	MEETINGS ATTENDED/ TOTAL MEETINGS	TOTAL ANNUAL REMUNERATION (GST INC.)
Dr Michele Allan **Appointed as Chair of BARC on 19 Oct 2021**	BAppSc MMgtTec MCommLaw DBA FAICD Experienced director and senior executive in private, public and tertiary sector. Extensive experience in risk, governance and financial management.	4 of 4 meetings	$8,160 per annum (Remuneration Tribunal determination) as Member then $16,320 per annum (Remuneration Tribunal determination) as Chair. Details of remuneration as a CSIRO Board member are at 3.3 of the Financial statements.
Mr Drew Clarke AO	BAppSc (Surveying) MSc GAICD FTSE Valuable mix of skills and experience in applied science, public policy, government administration and financial reporting.	4 of 4 meetings	$8,160 per annum (Remuneration Tribunal determination). Details of remuneration as a CSIRO Board member are at 3.3 of the Financial statements.
Professor Edwina Cornish AO	BSc (Hons) PhD FTSE AICD Valuable skills and experience as a senior executive in the tertiary and commercial sector.	4 of 4 meetings	$8,160 per annum (Remuneration Tribunal determination). Details of remuneration as a CSIRO Board member are at 3.3 of the Financial statements.
Ms Kathryn Fagg AO **Appointed as Chair of BARC on 28 June 2020 to 14 Oct 2021 (until promotion to Board Chair)**	BE (Hons) Chem Eng and MCom (Hons) FTSE GAICD Highly regarded director currently on the Boards of NAB and Medibank. Brings skills and experience from the private and public sector.	4 of 4 meetings	$16,320 per annum (Remuneration Tribunal determination) pro rata to 14 Oct 2021. Details of remuneration as a CSIRO Board member are at 3.3 of the Financial statements.
Dr Peter Riddles AM **Term ended 23 April 2022**	BSc (Hons) PhD Grad Dip Bus FAICD An experienced director to diverse organisations, including biotechnology start-up companies, industry organisations and university commercial offices.	4 of 4 meetings	$8,160 per annum (Remuneration Tribunal determination). Details of remuneration as a CSIRO Board member are at 3.3 of the Financial statements.
Mr Geoff Knuckey **Appointed as an External BARC Member on 16 March 2022**	BEc (ANU) FICA GAICD IIAM AIMM An experienced chair and non executive director with skills in financial reporting and analysis, risk management, corporate governance and internal audit. A former Partner and Managing Partner in Ernst & Young.	1 of 4 meetings	Remuneration not paid in 2021–22 financial year.

Appendix D: Meetings of the Board and Board Committees

During the financial year 2021–22, 8 Board meetings (2 out of session), 4 Board Audit and Risk Committee meetings, 4 Board People and Safety Committee meetings and 4 Board Science Excellence Committee Meetings were held. The number of meetings attended by each of the Board members was as follows:

BOARD MEMBER	CSIRO BOARD		CSIRO BOARD AUDIT AND RISK COMMITTEE	
	NUMBER ELIGIBLE TO ATTEND AS A MEMBER	NUMBER ATTENDED	NUMBER ELIGIBLE TO ATTEND AS A MEMBER	NUMBER ATTENDED
Kathryn Fagg	8	8	2	4
Larry Marshall	8	8	–	4
David Knox	8	8	–	1
Michele Allan	8	7	4	4
Drew Clarke	8	8	4	4
Edwina Cornish	8	8	4	4
Ian Macfarlane	5	5	–	1
Tanya Monro	8	7	–	–
Peter Riddles	7	7	4	4
Michelle Simmons	8	7	–	–
David Thodey	3	3	–	2

BOARD MEMBER	CSIRO BOARD PEOPLE AND SAFETY COMMITTEE		CSIRO BOARD SCIENCE EXCELLENCE COMMITTEE	
	NUMBER ELIGIBLE TO ATTEND AS A MEMBER	NUMBER ATTENDED	NUMBER ELIGIBLE TO ATTEND AS A MEMBER	NUMBER ATTENDED
Kathryn Fagg	4	4	–	4
Larry Marshall	–	4	–	4
David Knox	4	4	4	4
Michele Allan	–	2	4	3
Drew Clarke	4	4	–	4
Edwina Cornish	–	4	4	4
Ian Macfarlane	3	2	3	3
Tanya Monro	4	2	4	3
Peter Riddles	–	3	3	3
Michelle Simmons	3	3	3	2
David Thodey	1	1	–	1

Acronyms

Acronym	Explanation
ACDP	Australian Centre for Disease Preparedness
AI	Artificial intelligence
ALA	Atlas of Living Australia
ASKAP	Australian Square Kilometre Array Pathfinder
ASX	Australian Securities Exchange
ATCA	Australia Telescope Compact Array
ATNF	Australia Telescope National Facility
CDSCC	Canberra Deep Space Communication Complex
CERC	CSIRO Early Research Career
CPRs	Commonwealth procurement rules
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
BOM	Bureau of Meteorology
DAWE	Department of Agriculture, Water and the Environment
DFAT	Department of Foreign Affairs and Trade
DISER	Department of Industry, Science, Energy and Resources
EDP	Experimental Development Program
ESD	Enterprise Support Digitalisation Program
ET	CSIRO Executive Team
FOI Act	*Freedom of Information Act 1982*
FSP	Future Science Platform
FTE	Full-time equivalent
GDP	Gross Domestic Product
HPC	High-Performance Computing
I^2S^2	Inquiry for Indigenous Science Students program
ICT	Information and communication technology
IP	Intellectual property
MNF	Marine National Facility
MOU	Memoranda of understanding
NASA	National Aeronautics and Space Administration
NCI	Normalised Citation Index
NCRIS	National Collaborative Research Infrastructure Strategy
NICTA	National Information Communication and Technology Australia
NPS	Net Promoter Score
NRCA	National Research Collections Australia
PGPA	*Public Governance, Performance and Accountability Act 2013*
PID Act	*Public Interest Disclosure Act 2013*
PPE	Personal Protective Equipment
PV	Photovoltaic
R&D	Research and development
RDCs	Rural Research and Development Corporations
SAGE	Science in Australia Gender Equity
SIEF	Science and Industry Endowment Fund
SIR Act	*Science and Industry Research Act 1949*
SKA	Square Kilometre Array
SME	Small- to medium-sized enterprise
STEM	Science, technology, engineering and mathematics
UROP	Undergraduate Research Opportunities Program

Glossary

Granted patents: Once a patent application has been examined and satisfies various patentability criteria, it becomes a granted patent. It remains a granted patent until the end of the patent period (normally 20 years), provided renewal fees are paid.

Journal articles: Includes journal articles and other items published as part of a journal (for example, an editorial or book review).

Live patent cases: A live patent case is where either a patent application or a granted patent exists. It does not include cases that have lapsed, expired or been withdrawn. Applications may include provisional applications, Patent Cooperation Treaty (PCT) applications and applications pending in Australia or foreign jurisdictions.

Physical Containment level 4 (PC4) laboratories: Laboratories rated at the highest level of containment and the highest designated biosecurity level for working with highly transmissible diseases and viruses for which there is no vaccines or effective treatment.

PCT applications: International PCT applications are a 'temporary' phase in any international patenting process and these have a life span of 18 months. This type of application is very common in major international corporations and is used by CSIRO when it considers its invention may have wide commercial application. In view of the 18-month time span, it is reasonable to approximate that two-thirds of the reported number were filed in the previous 12-month period.

Recordable injury frequency rate: This is calculated as the sum of Lost Time Injuries per million hours worked plus Medical Treatment Injuries per million hours worked.

Science excellence: An assessment of the competitiveness of CSIRO's research capabilities, it recognises CSIRO's science (for example, total citations) and excellence (for example, citation rates). It tends to be output-oriented and includes lagging metrics relating to research publication performance (bibliometrics), esteem measures, such as awards, and expert-peer reviews.

Scope 1, 2 and 3 greenhouse gas emissions: Greenhouse gas emissions are organised into scopes to avoid double-counting emissions and indicate those that organisations can control (Scope 1) versus those that they can influence (Scope 3). Scope 1 are emissions from sources that are owned or controlled by the organisation. Scope 2 are emissions from the consumption of purchased electricity, steam or other sources of energy generated upstream from the organisation. Scope 3 are emissions that are a consequence of the operations of an organisation but are not directly owned or controlled by the organisation.

Sponsored students: Students are deemed to be sponsored if they receive a full or partial scholarship paid from CSIRO funds to pursue a research project leading to a PhD, master's or Honours degree. This excludes CSIRO employees, whose study expenses are considered to be training and development.

SIEF Ross Metcalf STEM+ Business Fellowship program: Run through the Science and Industry Endowment Fund, the program embeds early career researchers into an industrial workplace over a 2 to 3-year period.

Supervised students: Students are deemed to be supervised if they have a CSIRO staff member appointed officially by the university as a co-supervisor for their research project. Normally, CSIRO staff are joint supervisors in conjunction with a university academic.

Technical reports: Includes individually authored chapters as well as whole reports that are subject to peer review and usually publicly released.

Telehealth: The use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration.

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PGPA RULE REFERENCE	PART OF REPORT	DESCRIPTION	REQUIREMENT
17BE	Contents of annual report		
17BE(a)	124	Details of the legislation establishing the body	Mandatory
17BE(b)(i)	6–8, 124	A summary of the objects and functions of the entity as set out in legislation	Mandatory
17BE(b)(ii)	8, 36	The purposes of the entity as included in the entity's corporate plan for the reporting period	Mandatory
17BE(c)	124	The names of the persons holding the position of responsible Minister or responsible Ministers during the reporting period, and the titles of those responsible Ministers	Mandatory
17BE(d)	124	Directions given to the entity by the Minister under an Act or instrument during the reporting period	If applicable, mandatory
17BE(e)	124	Any government policy order that applied in relation to the entity during the reporting period under section 22 of the Act	If applicable, mandatory
17BE(f)	N/A	Particulars of noncompliance with: (a) a direction given to the entity by the Minister under an Act or instrument during the reporting period; or (b) a government policy order that applied in relation to the entity during the reporting period under section 22 of the Act	If applicable, mandatory
17BE(g)	36–113	Annual performance statements in accordance with paragraph 39(1)(b) of the Act and section 16F of the rule	Mandatory
17BE(h), 17BE(i)	124	A statement of significant issues reported to the Minister under paragraph 19(1)(e) of the Act that relates to noncompliance with finance law and action taken to remedy noncompliance	If applicable, mandatory
17BE(j)	36, 126–127, 214–217	Information on the accountable authority, or each member of the accountable authority, of the entity during the reporting period	Mandatory
17BE(k)	118–119	Outline of the organisational structure of the entity (including any subsidiaries of the entity)	Mandatory
17BE(ka)	212–213	Statistics on the entity's employees on an ongoing and non-ongoing basis, including the following: (a) statistics on fulltime employees; (b) statistics on part time employees; (c) statistics on gender; (d) statistics on staff location	Mandatory
17BE(l)	94–95, 120	Outline of the location (whether or not in Australia) of major activities or facilities of the entity	Mandatory
17BE(m)	125–137	Information relating to the main corporate governance practices used by the entity during the reporting period	Mandatory

PGPA RULE REFERENCE	PART OF REPORT	DESCRIPTION	REQUIREMENT
17BE(n), 17BE(o)	134	For transactions with a related Commonwealth entity or related company where the value of the transaction, or if there is more than one transaction, the aggregate of those transactions, is more than $10,000 (inclusive of GST): (a) the decision making process undertaken by the accountable authority to approve the entity paying for a good or service from, or providing a grant to, the related Commonwealth entity or related company; and (b) the value of the transaction, or if there is more than one transaction, the number of transactions and the aggregate of value of the transactions	If applicable, mandatory
17BE(p)	N/A	Any significant activities and changes that affected the operation or structure of the entity during the reporting period	If applicable, mandatory
17BE(q)	N/A	Particulars of judicial decisions or decisions of administrative tribunals that may have a significant effect on the operations of the entity	If applicable, mandatory
17BE(r)	N/A	Particulars of any reports on the entity given by: (a) the Auditor General (other than a report under section 43 of the Act); or (b) a Parliamentary Committee; or (c) the Commonwealth Ombudsman; or (d) the Office of the Australian Information Commissioner	If applicable, mandatory
17BE(s)	N/A	An explanation of information not obtained from a subsidiary of the entity and the effect of not having the information on the annual report	If applicable, mandatory
17BE(t)	131	Details of any indemnity that applied during the reporting period to the accountable authority, any member of the accountable authority or officer of the entity against a liability (including premiums paid, or agreed to be paid, for insurance against the authority, member or officer's liability for legal costs)	If applicable, mandatory
17BE(taa)	125, 218	The following information about the audit committee for the entity: (a) a direct electronic address of the charter determining the functions of the audit committee; (b) the name of each member of the audit committee; (c) the qualifications, knowledge, skills or experience of each member of the audit committee; (d) information about each member's attendance at meetings of the audit committee; (e) the remuneration of each member of the audit committee	Mandatory
17BE(ta)	169–172	Information about executive remuneration	Mandatory

PGPA Rule Section 17BE (h) – (i) Significant non-compliance with Finance Law

DESCRIPTION OF NON-COMPLIANCE	REMEDIAL ACTION
N/A	

Science and Industry Research Act 1949		
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csiro.au/contact

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