

Australia's National Science Agency



Corporate Plan 2020–21

Cover: Understanding COVID-19

This is the coronavirus. It was isolated from the first Australian case and captured in this colourised transmission electron micrograph image.

Around the world, we're seeing countries and communities being reshaped by the COVID-19 global pandemic. To assist the nation and the world in understanding the virus, we're drawing on our world-leading researchers to help Australia's quest for a vaccine.

Read more about the effects of the virus and how we're collaborating to solve this challenge on pages 14–19 and 36.

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Understanding and managing bushfires

In many ecosystems around the world, bushfires are a critical process for long-term sustainability. But when conditions are conducive, bushfires can become intense and destructive.

We're undertaking fundamental research into the behaviour and suppression of bushfires for state land management agencies and rural fire authorities. In collaboration with internal and external partners, we're undertaking large-scale experimental field studies of free-moving fires. We're working on better detection methods, enhanced fire spread simulating models and suppression effectiveness models. When these are linked into a single modelling environment (Spark), they allow agencies to prioritise efforts to suppress new and running fires according to their potential to cause loss.

Spark is a state-of-the-art fire spread simulation framework for simulating the spread of fire across the landscape and is used by fire authorities in New South Wales, South Australia, Queensland, Victoria and Tasmania.

Read more about our response to the bushfires on pages 14–19 and 35–36.





Introduction



1.1 Opening statement

On behalf of the CSIRO Board, I am pleased to present our key strategic planning document, the CSIRO Corporate Plan 2020–21.

At a time when Australia and the world is responding to the impact of COVID-19, the role of our national science agency in future-proofing our nation and building resilience has never been more important. CSIRO has been a steady, guiding hand of science and research for 100 years, and today more than ever, our scientists are living our purpose of solving Australia's greatest challenges.

CSIRO is an incredible national asset. As Chair, I am constantly reminded of how fortunate we are to have this talented group of scientists and researchers who are working at the forefront of our response to some of the greatest challenges of our time. We must not underestimate how important this is to our future security and prosperity.

The Board fully endorses CSIRO's mission-led strategy. We are committed to supporting CSIRO in partnering with our universities and business partners to work together on these challenges for the good of our nation.

This Corporate Plan builds on previous plans to outline how CSIRO will deliver on its purpose for the next four years (2020–21 to 2023–24), how our key priorities align with the legislation that guides CSIRO, and how success will be measured.

The Corporate Plan meets the requirements of s35 (1) (b) of the *Public Governance, Performance and Accountability Act 2013,* the CSIRO Statement of Expectations of February 2020 and the responding CSIRO Statement of Intent of May 2020.



Set out in these pages is a clear, focused plan for CSIRO to unlock a better future for all Australians. As one of the largest mission-driven multidisciplinary science and research organisations in the world, CSIRO strives to earn the trust required to build consensus and develop long-term solutions that create impact. I can think of no better organisation to guide our thinking and steady our course.

David Thodey AO

Chairman of the Board

1.2 Chief Executive's foreword

Science is in sharp focus as Australia, and the world, grapples with a damaging year and contemplates recovery.

Australia's resilience and recovery is being put to the test in a year where we have experienced devastating bushfires, drought and the global COVID-19 pandemic. The first recession in 30 years is seeing increasing pressure on our communities and industries. The world's landscape – how we work, trade, travel, collaborate – is changing. It is a sobering time and a moment to consider the future we are shaping. A future that can be driven by science.

The disruption of this year has brought CSIRO's purpose into the fore as we have used our innovative science and technology to solve these great challenges. Never in our lifetime has a country – or the world – turned to scientists in the way they are now.

The Corporate Plan is a focal point to ensure your national science agency continues to play a critical role of science for our nation's recovery and future resilience: to ensure the science we create has impact and benefit for Australia by collaborating with government, industry and academia to grow our national innovation performance; to provide the research community with access to the world-class facilities and collections we manage on behalf of the nation; and to ensure we continue to develop the best talent, for the benefit of Australia.

Missions

A hundred years ago a newly formed CSIRO – created to use science to redefine our future – was given its first national mission, to tackle the invasive Prickly Pear which was rendering so much prime agricultural land useless. Scientists worked with farmers, government departments and communities on a biological control response, and identified a solution in the brown-grey Cactus Moth, which soon nibbled the problem into oblivion.

Now, 100 years on, CSIRO continues to work with government, universities, industry and the community as a key part of our approach on a new missions program to bolster Australia's COVID-19 recovery and build long-term resilience. The program of large-scale, major scientific and collaborative research initiatives, will be aimed at solving some of Australia's greatest challenges, focused on outcomes that lead to positive impact, new jobs and economic growth.



There has never been a more important time for a bold and visionary approach to drive Australia's recovery, and as the missions are co-developed we look forward to sharing more about their intent and impact.

Digital transformation

In recent Corporate Plans we've identified the power of combining deep domain expertise with new digital technologies, and have made strong progress on driving the national science agency's digital transformation. This has been critical in underpinning a rapid pivot to new ways of working this year, including working from home and reducing density at our critical scientific infrastructure, while protecting our people and our knowledge from cyber threats. It has unlocked new opportunities for CSIRO as well as Australia, which we will seize by increasing the pace and scale of our science delivery through digital technologies, as well as building digital capability in our workforce and adapting our workplaces for future ways of working.

This Corporate Plan sets our strategy for the next four years, but we couldn't deliver any of it without our exceptional people. This plan outlines the strategic initiatives that will enable their commitment to science excellence, their generous collaborative spirit, and their passion for solving challenges to make life better. It charts a course for Australia's recovery and future resilience, through today's crises and to prepare for tomorrow's.

Dr Larry Marshall

Chief Executive

Protection from the virus

In addition to our critical COVID-19 virus and vaccine research, we're also preparing to scale up vaccine production through our biological production facility, providing advice around personal protective equipment materials, and providing federal and state health agencies with data tracking and forecasting to support decisions around Australia's outbreak response.

Read more about our research and facilities on pages 34–37.





Our purpose and strategy

Our strategy directs how we will achieve our purpose.



2.1 Strategy at a glance

Purpose

Solving the greatest challenges through innovative science and technology.



The centre of our cultural vision

People first

Further together

Vision

We are Australia's innovation catalyst, collaborating to boost Australia's innovation performance.



2.2 Our purpose and strategy

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 (PBS) outcome statement, we describe our purpose as:

Solving the greatest challenges through innovative science and technology.

Our vision

We are Australia's innovation catalyst, collaborating to boost Australia's innovation performance.

Our strategy

Our strategy directs how we will achieve our purpose. It comprises our objectives, activities and outcomes, supported by strategic pillars that guide our science.

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 uptake of world-class scientific research.
- 2. Mobilise and develop the best talent for the benefit of Australia.
- 3. Manage national research infrastructure for the nation.
- 4. Ensure the sustainability of CSIRO.

Challenges

We identified these challenges as the areas of greatest importance to Australians. We solve these challenges through our portfolio of missions. Together the challenges and missions will drive Australia's recovery and resilience following recent national crises.

Health and wellbeing

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

Food security and quality

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

A secure Australia and region

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

Resilient and valuable environments

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

Sustainable energy and resources

Building regional energy and resource security and our competitiveness while lowering emissions.

Future industries

Creating Australia's future industries and jobs by collaborating to boost innovation performance and STEM skills.

Challenges and missions

Australia has not seen a challenge like COVID-19 before, which makes this a unique opportunity for innovation to support recovery through purposeful, coordinated action to achieve strong and inclusive growth. Each of our missions has been designed to support national growth opportunities by creating new industries or supporting our existing ones to thrive. We developed a metal membrane to extract pure hydrogen from ammonia, paving the way for a new export market.

Missions

To help us solve each challenge, our new missions program will bolster Australia's COVID-19 recovery and build long-term resilience, focused on outcomes that lead to positive impact, new jobs and economic growth.

Missions will reach beyond what is possible today. Due to their scale, ambition and collaborative nature, mission proposals will take time to co-develop with partners in Australia (and in many cases globally).

Co-creation opportunities will be explored to help Australia achieve these outcomes:

- increase our resilience and preparedness against **pandemics**
- mitigate the impact of disasters: drought, bushfires and floods
- create a **hydrogen industry** to generate a new clean energy export industry
- accelerate the transition to **agile manufacturing** for higher revenue and sovereign supply

- overcome our **growing resistance to antibiotics**, so they keep saving lives
- create a national climate capability to **navigate climate** change uncertainty
- help our farmers overcome drought, mitigate climate impacts, increase yield and profitability, create a sustainable future protein industry and leverage the world's love of Australian-grown food to collectively drive our trusted agriculture and food exports to \$100 billion
- use technology to navigate Australia's **transition to net zero emissions**, without derailing our economy
- safeguard the health of our waterways by **monitoring** the quality of our water resources from space
- create new industries that transform raw mineral commodities into unique higher-value products like critical energy metals that build Australia's value added offering, jobs, and sovereign supply
- end **plastic waste** by reinventing the way plastic is made, processed and recycled
- double the number of **SMEs** utilising Australian R&D to become a **collaboration nation**.



Enhancing water security in the Murray-Darling Basin

The Murray-Darling Basin is the largest river system in Australia. It generates 40 per cent of the gross value of agricultural production in our nation and supplies water to over two million Australians.

Demands on the Basin's variable flows have increased significantly, resulting in a loss of water security for communities, industries and the environment.

In 2006, the Australian Government asked us to lead the Murray-Darling Basin Sustainable Yields Project, which assessed the available water within the Basin. In 2011, we were commissioned to assess the multiple benefits of returning water to the Basin, and to place a monetary value on those benefits where possible – and our Environomics Future Science Platform has been central to this work. It has supported the development of water plans, set new sustainable limits on water use and shaped the development of a Basin strategy. This research was the first of its kind in the world and has provided governments, industry and communities with trusted information to guide future resource planning, management and investment in the Basin.

Strategic pillars

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

Customer focus

Focusing on our customers' needs today and in the future by actively prioritising our resources and relationships on the highest impact opportunities.

Thriving people and teams

Putting our people and their safety first, while supporting them to thrive and adapt in a changing world.

Collaborative networks

Leveraging our unique role as a connector with customers and partners to drive the uptake and adoption of solutions and improve Australia's innovation performance.

Solutions from science

Through excellent science, engineering, technology and innovation, provide trusted, effective solutions for industry, government and the community.

National benefit from global engagement

Connecting the world's best partners and capability to catalyse the uptake of our science and solutions and strengthen Australia's security and competitiveness.

Values

Our values guide our cultural vision by clarifying what we consider important – guiding behaviours and decision-making for all our people. Our values articulate the manner in which we work every day as we deliver on our strategy.

People first

Caring for everyone's safety and wellbeing. Seeking out, listening to and learning from our differences. We do this by being respectful, caring and inclusive.

Further together

Achieving more together than we ever can alone. Celebrating our successes and our failures, leveraging them to achieve even greater things. We do this by partnering, cooperating and by being humble.

Making it real

Embracing ambiguity, taking educated risks, stimulating discussion and delivering science for impact. We do this by being curious, adaptive and entrepreneurial.

Trusted

Providing dependable, evidence-based answers driven by purpose. Earning trust through everything we do. We do this by being accountable, authentic and courageous.

Multiple coral spawning on the Great Barrier Reef

Together with scientists at the University of Queensland, we discovered that when coral colonies spawn more than once a year, it can lead to better resilience for our coral reefs. The more larvae that set off into the water, the more chances they have to find new homes to help establish coral recovery. We also discovered that the corals that spawned over multiple months were successful in spreading their offspring across a greater diversity of reefs throughout the Great Barrier Reef.

To understand the impacts of this spawning, we applied techniques involving network modelling, coral biology, ecology, and oceanography. This meant we could simulate the dispersal of coral larvae during these split spawning events across the whole of the Great Barrier Reef. The results showed an increase in diversity of larvae, and better reliability for the larvae to reach different areas of the Reef.

These findings explain the higher chances of recovery for reefs in the region during split-spawning years. The extra spawning events provide a more robust supply of coral larvae to reefs.





Our operating environment

The external insights, risk management framework and collaborative partnerships that influence our strategy.



3.1 Trends influencing our strategy

We leverage external insights and our own science, such as the *Australian National Outlook 2019*, Future Science and Technology, and industry roadmaps, to inform our research portfolio decisions and strategic direction. We actively monitor and analyse key global, national and internal trends and other events that influence our strategic direction.



THE TREND

Global connectivity and pandemics

The world is more connected than ever before, and flows of trade, capital, information and people continue to deepen and broaden at an increasing rate. This has contributed to economic growth but also heightened the rapid spread of pandemics such as the Hendra virus, Severe Acute Respiratory Syndrome, Middle East Respiratory Syndrome and COVID-19.

Balancing growth with sustainability

Rising global population along with increasing economic activities are depleting natural resources and causing a loss of biodiversity across the globe. Climate change has also become a significant economic, environmental and social issue with natural disasters such as hurricanes, droughts and bushfires becoming more intense and frequent.³ Direct economic losses and damage from natural disasters in 2019 were estimated at US \$232 billion.⁴

The fourth industrial revolution

The next wave of digital innovation – referred to as the fourth industrial revolution and characterised by platform technologies, such as Artificial Intelligence (AI) – is creating a connected virtual world. The wave is globally disrupting entire systems of production, management, and governance and expected to create \$10–15 trillion of global opportunity.⁶

Rise of Asia

Rapid economic growth in Asia has shifted the world's economic centre of gravity east. Today, foreign direct investments to the Association of South East Asian Nations (ASEAN) are rising at a record level.⁸

China's Research and Development (R&D) investment (\$526 billion in 2018⁹) has surpassed the total R&D investments of the European Union.¹⁰ India has been ranked as the top innovation destination in Asia.¹⁰

Health of an ageing world

The global population aged 60 years or more is forecast to make up 22% of the total population by 2050, up from 12% in 2012.¹¹ This shift is also expected to reduce the proportion of the working age population.

We have been predicting and solving challenges for more than 100 years. Recent national crises such as bushfires and COVID-19 will prioritise our areas of focus in addressing these challenges through innovation and future-proofing Australia.

THE IMPACT

Pandemics, such as COVID-19, cause social and economic crises and expose the lack of preparedness and resilience of the increasingly globalised and interconnected economy.¹ They necessitate the international coordination of research and development activities exemplified by the extraordinary work of the Coalition for Epidemic Preparedness Innovations.

Australia's climate has warmed by just over 1°C since 1910, leading to an increase in the frequency of extreme heat events and the severity of drought conditions during periods of below average rainfall.⁵ Increased societal awareness and climate-related concerns are driving pressure to balance economic growth with sustainable operations. Greater attention is being paid to energy, water and food management, as well as transitioning to more effective circular economies to manage waste.

In Australia, digital technology is expected to contribute between \$140 billion and \$250 billion to the gross domestic product by 2025.⁷ Events such as COVID-19 demonstrate that digital innovation is also critical in Australia's ability to successfully manage and mitigate a social and health crisis.

Compared to OECD peers, Australia has captured a third less value from digital innovation. $^{\rm 6}$

As a regional neighbour, Australia is well-placed to benefit from this economic shift east. China, Indonesia and Singapore are some of Australia's largest trading partners and contribute substantially to its GDP and exports.

A rapidly ageing world population is affecting the economic output and escalating healthcare expenditure by changing people's lifestyles, the services they demand, and the structure and function of the labour market.

There are growing opportunities for the innovation sector to advance medical sciences and deliver services that will improve the health and wellbeing of the ageing world.

CSIRO'S RESPONSE

Our One Health approach recognises that human, animal and ecosystem health are inextricably linked.² Our research is focused on developing faster, more sensitive diagnostic and surveillance tools, new vaccines and antiviral therapeutics to limit the wide-ranging impacts on our closely interconnected and highly mobile world. Through international collaborations and infrastructure such as our Australian Centre for Disease Preparedness, we are ensuring we have capability to manage and mitigate new emerging infectious diseases. In addition, the COVID-19 Business Transition Program will support our ability to deliver impact more broadly in a post Coronavirus world.

Through our large-scale programs of work such as missions, we use a multi-stakeholder approach. We are applying our digital, land and water management, urban area planning, modelling, and sustainable energy and resources capability, often at complex system levels, to deliver innovative solutions for a resilient and valuable environment.

Our research and expertise in information technology, AI, data, and digital across our Business Units including Data61 and the Challenges and Digital Transformation Program are helping us to lead the way in the fourth industrial revolution. We will capture opportunities for Australia and secure the nation's digital future.

In partnership with other government departments, our strategic pillar National benefit from global engagement capitalises on our geographic proximity and strong ties to Asia. Our ASEAN presence in Vietnam, Singapore and Indonesia connects us to Asian hotspots of knowledge generation, trade opportunities and global talent.

Through our Business Units, Future Science Platforms and missions (read more on page 34) we are developing a range of preventative, personalised biomedical and digital health solutions that will enhance health wellbeing and longevity of all Australians.

THE TREND

Australia's global innovation performance

Australia's innovation system's research accomplishments are impressive, underpinned by a strong education system. However, the translation of research to commercial enterprises is relatively poor.

Australia's ranking dropped two places to 22nd of 129 economies in the Global Innovation Index 2019 rankings.¹²

Australia's R&D investment

Australia's gross expenditure on R&D as a proportion of the Gross Domestic Product (GDP) fell from 1.88% in 2015–16 to 1.79% in 2017–18.¹⁴ This is well below the OECD average of 2.37%.¹⁵

In recent years, spending on R&D by government (GovERD) and business (BERD) as a proportion of the GDP has diminished, but higher education expenditure on R&D (HERD) has increased.¹⁴

Australia's skill transition

Science, technology, engineering and mathematics (STEM) and digital skills will play a vital role in realising Australia's innovation and productivity potential.

Over the next 5–10 years, 50% of employers expect an increased demand for STEM-trained professionals.¹⁹

Trust in institutions

Overall trust in Australian governments, businesses, non-governmental organisations and the media has declined in recent years.²² This threatens their social license to operate and restricts their ability to implement long-term strategies.





ТНЕ ІМРАСТ

To compete globally in the \$1.6 trillion innovation race,¹³ Australia will have to undertake more new-to-world innovation compared to incremental innovation, and improve its collaboration, translational and commercialisation track records.

CSIRO's share of the government's total R&D appropriation investment has been slowly declining from the peaks of around 30% in the early 1980s to around 9% in 2018–19.¹⁶

However, in the last few years, the proportion of GovERD being funded by industry has risen from 7.7% in 2012 to 10.3% in 2016.¹⁷ A likely reason is the stronger links that publicly funded research agencies such as CSIRO have developed with industry. Australia now ranks ahead of countries such as the US in the proportion of GovERD funded by industry.¹⁸

In Australian schools, enrolments in STEM subjects are at the lowest levels in 20 years²⁰ and long-term trends indicate students' performance in STEM subjects is slipping.²¹ The country's talent pool is limited by gender inequity in STEM education and careers.

Australia needs a greater investment to develop students' STEM skills.

Fortunately, 33% in Australia and New Zealand have a high level of trust in their scientists compared to 18% globally.²³ This level of trust is key to R&D organisations like CSIRO in building consensus and developing solutions that address challenges.

CSIRO'S RESPONSE

In our role as Australia's innovation catalyst, we boost innovation by collaborating with all key players of the innovation system – universities, government and industry – to solve the greatest challenges. We seek to strengthen Australia's translational and entrepreneurial skills through programs such as Innovation Connections and the CSIRO Innovation Fund (read more on page 40). A key focus of our strategy is to work with small to medium-sized enterprises to build national sovereignty in core industries such as manufacturing and food to optimise Australia's independence in times of limited trade, pandemics and global competitiveness for resources.

Our strategic pillars, Customer focus, National benefit from global engagement and Collaborative networks, along with the Challenges and Digital Transformation Program, encourage greater collaboration across the global innovation system to support R&D investments to go further and address issues aligned to national priorities.

We strengthen Australia's STEM talent pipeline through education and outreach programs in schools and communities (read more on page 43). We continue that support for universities through our Industry PhD program and postdoctoral fellowships to encourage STEM professionals into industry and the innovation system. As a Male Champion of Change for gender equity, our Chief Executive leads our efforts to promote diversity in STEM. This is supported by our commitment to the Science in Australia Gender Equity (SAGE) program and strong advocacy for the Advancing Women in STEM strategy and the Women in STEM Decadal Plan.

To build our trusted advisor role, we share messages and evidence of our impact to our partners, community and government that highlight our scientists' reputations for world-class pioneering research (read more on page 36). We deliver evidence-based answers and earn trust through our integrity, transparency, honesty and excellence in everything we do.

Internal trends influencing our strategy



THE TREND

CSIRO's role in solving national challenges

As the nation's science agency, our purpose is to solve the greatest challenges through innovative science and technology. It's a purpose that's endured for more than 100 years that will continue to guide us into the future.

Shifting research methods

Research methods are evolving rapidly, providing opportunities to address previously intractable science questions by bringing together cross-disciplinary capbilities.

Future of work

Society is fundamentally transforming the way it works. Automation and 'thinking machines' are replacing human tasks, changing the skills that organisations are looking for in their people. Competition for the right talent is fierce. And 'talent' no longer means the same as 10 years ago – many of the roles, skills and job titles of tomorrow are unknown to us today.²⁴

Health and safety

CSIRO workplaces include chemical and engineering facilities, laboratories, pilot plants, glasshouses, animal and field stations, and offices. Our people also work away from base in a variety of hazardous environments including mine sites, oil rigs, farms, forests, mountains, deserts and water bodies. Climate events, bushfires and pandemics add to the operational risks.

With diverse operations both overseas and in Australia, we continue to be ever vigilant in protecting the wellbeing of our people, partners and the community.

Infrastructure and property footprint

In 2000, we operated from more than 76 research facilities and sites across metropolitan and regional areas of Australia. This has been reduced to 55 sites in Australia and three sites overseas. We also have a presence in 26 other locations which include monitoring stations, testing racks and hosted occupancies. We aim to further consolidate our sites to support a more sustainable property footprint. We also aim to build agility to manage risks and disruptions, such as COVID-19, while prioritising the wellbeing of our people.

ТНЕ ІМРАСТ

Our endurance in delivering national impact is our ability to adapt and meet – head on – the changes that our environment, our society and our economy undergo. We regularly review our research portfolio, rationalise programs and create greater economies of scale by working closely with collaborators across the innovation system. This is particularly important in the short-term as the recent global economic downturn may lead to investment in research and development being deprioritised as government and industry seek to stabilise budgets.

Digital capabilities are enabling us to use vast volumes of data. Non-classical-quantum sciences are revealing fresh insights into physical processes. There is also an increasing move to multi- and interdisciplinary science and technology, including the importance of the humanities and social sciences.

These momentous changes raise huge organisational, talent and human resources shifts. Adaptability – in organisations, individuals and society – will be essential for navigating the changes ahead. Businesses will have to ease the routes to training and retraining, and encourage and incentivise adaptability and the critical skills of leadership, creativity and innovation.

Our widely varied safety risk profile adds complexity to our commitment to providing the safest work environment for our people. In 2019–20, our safety performance on Recordable Injury Frequency Rate was 11.3, an improvement over the previous year of 12.8. Our Comcare claims declined to 28 in 2019–20, compared to 37 in 2018–19. We aspire to zero harm at work and our safety performance has room for improvement.

Our dispersed property footprint, infrastructure and work environment need to align better with our future workforce, which will be digitally driven, agile and adaptable. With the increased virtualisation of work and more of our people working remotely, we expect our infrastructure will shift to enable and promote more virtual sites. We will also have an increased focus on centres of excellence that are equipped with modern, virtual labs, enhanced digital tools and platforms, collaborative workspaces, and an efficient carbon footprint.

CSIRO'S RESPONSE

We are solving Australia's greatest challenges through our research and missions – large scale research initiatives aimed at driving breakthroughs with the engagement of the whole system – industry, government, universities and communities. Our Customer focus pillar is focusing on deeper, impactful relationships, and our and Business Transition Program is ensuring we are adapting to the impacts of COVID-19 and helping Australia in its recovery.

In this rapidly evolving environment, shaping a clear, long-term science and technology direction is critical for maintaining our competitive advantage. We are looking at our Future Science and Technology plan to identify key cross-cutting capabilities that will be critical to address the challenges and position Australia for a prosperous future (read more on page 58).

Innovation comes from diversity in all its forms, and the changing nature of work provides a significant opportunity for us to rethink and redesign how our workforce is structured. We are developing comprehensive People and Workforce strategies to address the dynamics of the changing workplace requirements. We are focusing on current and future capabilities, developing an agile workforce, delivering a great people experience, and caring for each other (read more on page 50).

With a strong focus on the wellbeing of our people, we have a new Health, Safety and Environment (HSE) strategy with five focus areas – a single HSE enterprise system, leadership and management capability, a proactive risk management culture, health and wellbeing, and environmental management. The strategy will improve our safety maturity, wellbeing and morale of our people (read more on page 50).

The Property Strategy and the new ways of working stream under the Business Transition Program are reviewing our future workplace needs, property, infrastructure and safety requirements. These groups are developing plans to establish safe, fit-for-purpose infrastructure that supports collaborative, sustainable, world-class research and operations.

3.2 Risk management framework

Strategic risks

Our most critical strategic and operational risks are summarised in the table below. These risks, along with significant immediate and emerging risks and issues are regularly reported and discussed at the executive level and within Business Units and functional areas.

KEY RISK

Failing to maintain a safe and secure operating environment through managing:

- health, safety and environment (HSE)
- physical, protective and cyber security
- biosecurity and safety.

Failing to conduct our science and business activities with integrity and in a manner that upholds our Code of Conduct.

Failing to prioritise our science to deliver the greatest impact in a dynamic global and national context.

Failure to fully recognise the global, national and policy context in which CSIRO operates, and to plan, invest and collaborate such that Australia's investment in CSIRO as a multidisciplinary science organisation delivering impact to Australian industry and the community is maximised.

Failing to develop and adopt strategies necessary to ensure the fundamental enabling elements of the organisation are optimised to successfully achieve relevance and impact:

- culture
- business model
- talent
- financial sustainability
- scientific infrastructure
- governance, business processes and systems.

RELATIVE RISK APPETITE AND TOLERANCE

We have a high risk appetite to empower and trust our people to act autonomously balanced with a commensurate level of accountability. However, we have low to no appetite for:

- deliberate or reckless breaches of our legal, regulatory, professional standards, research or ethics, bribery or fraud in the pursuit of our objectives
- behaviours that place the integrity of our science and commercial dealings at risk
- actions and behaviours that endanger and undermine our people's wellbeing and workplace safety, including inaction on unacceptable HSE risks, even if the required action impacts project timeframes, cost or customer expectation.

We have a relatively high appetite and tolerance for risks associated with the breakthrough science and global collaboration required to achieve impact and benefit for the nation.

We recognise that risks are inherent in pursuing breakthrough science and innovation, often in highly contentious areas and in offshore locations, accepting, that at times, this may draw criticism or that there may be a high technical or scientific risk of failure. We take a balanced approach to addressing these commensurate with a level of accountability, including that benefits and risks must be fully understood in advance, and that sensible measures are always in place to treat risks.

We have a high-risk appetite to:

- empower and trust our people to act autonomously, balanced with a commensurate level of accountability
- achieve adaptability and agility in responding to our customers.

Whilst we strive to achieve long-term financial sustainability and growth, we have a moderate appetite for:

• short-term financial loss where aligned to the pursuit of our innovation agenda providing there is a balanced set of controls in place to manage the risk to an acceptable level.

However, we have low to no tolerance for:

- deliberate or reckless breaches of legal and regulatory obligations and the CSIRO Code of Conduct
- compromising processes that support good governance and efficient use of organisational resources
- the ineffective, inefficient, uneconomical or unethical use of the resources entrusted to the organisation by government and other funders.



HOW WE MANAGE RISKS

Risks related to safety and security are managed through an extensive array of existing frameworks and controls at the enterprise, Business Unit and activity levels. These are routinely enhanced through regular internal and external reviews and the implementation of recommended actions. In particular, we are committed to and are implementing a significant uplift in organisational health, safety and wellbeing due to global pandemics and ongoing security including cyber security.

Scientific integrity is underpinned by extensive controls including peer review of science, ethics and publication approvals. The conduct of our business operations is subject to the application of our governance and accountability frameworks and mechanisms. The policies, processes and systems underpinning these are subject to regular internal and external reviews.

The risk is managed through controls and mitigation strategies that include:

- establishing a Challenges and Digital Transformation Program for the organisation to sharpen our strategic focus on the most important challenges for Australia
- an enterprise investment planning process to achieve a research portfolio that balances national benefit and preparedness, and commercial focus
- achievement of planned outcomes is measured against the achievement of performance measures and monitored through our Planning and Performance Framework
- the application of our Governance and Policy Framework provides further support in achieving planned outcomes, especially in managing activities in contentious areas.

The risk is managed through a range of organisational initiatives that are focused on:

- people development and culture change programs supporting change in the way we collaborate, communicate and deliver impact through science
- leadership appointments and priorities to support achievement of culture change objectives
- development and execution of medium and long-term strategies to adjust our business model and underlying policies, processes and practices to facilitate new initiatives including the Challenges and Digital Transformation Program
- in the context of our COVID-19 response, we demonstrate agility and flexibility in adjusting our processes and work practices
- specific Executive Team endorsed strategies and initiatives to support long-term financial sustainability and the evolution of our property portfolio.

Risk tolerance

Risk appetite



How we manage risks

Reviewing and improving our risk management

The identification and management of risk is central to delivering our purpose and – in turn – maximising the impact of our science and benefit to Australia. This includes understanding scientific, financial, customers and markets, legal and compliance, health, safety and security, environmental, brand and reputational risks. By actively identifying and managing strategic, operational and external risks we aim to increase our effectiveness as an organisation and provide greater certainty and confidence for the Government, our people, collaborators and other stakeholders in the community about our operations.

Risk framework

Our risk framework, methodology and approach are grounded in and aligned with both the international standard AS/NZS ISO 31000 Risk Management Principles and Guidelines and Commonwealth Risk Management Policy. Our risk framework is applied at the enterprise, Business Unit/functional and activity levels as illustrated left.

Risk committees

The CSIRO Board is also active in supporting our efforts to identify and manage our risks though three Board standing committees:

- People and Safety Committee assists the Board to fulfil its governance responsibilities in relation to organisational development, people-related activities, and health and safety.
- 2. Audit and Risk Committee assists the Board in the areas of financial management, risk management internal control, and compliance.
- 3. Science Excellence Committee assists the Board to endorse, oversee, and monitor the implementation of our strategic plans with respect to maintaining and growing our scientific excellence, its connection to delivering impact, and our role as innovation catalyst in the national innovation system.

Risk culture and capability

We are developing a culture and increasing organisational risk maturity in a way that supports taking risks where this is done mindfully, within organisational tolerances and is managed effectively.

Integration

Risk is aligned with key processes to enable decision-making. We continue to strengthen that alignment by increasing risk capability applied to each element of our strategic planning and execution framework.

3.3 Our organisational structure and subsidiaries

Our organisational structure

(as at 31 August 2020)



We deliver impact to the nation through three lines of business. For information about our Business Units, Services and national research infrastructure, see objectives 1, 2 and 3 on pages 34, 42 and 45. Our enterprise support functions provide advice and support across the Operations, People and Growth areas (see objective 4 on page 48). Our subsidiaries play a critical part in our ability to achieve our purpose. We have offshore representation that supports our global engagement, and funds that invest in science areas that create new opportunities for Australian innovation. Find out more about our global and funds initiatives on pages 39 and 41.



3.4 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. The diversity of our collaborators drives our innovation, from strategic advisory and planning, to research and development, to programs and funding.







Tracing sewerage for COVID-19 tracking

Our researchers, in partnership with the University of Queensland, successfully demonstrated the presence of SARS-CoV2, the virus which leads to the disease COVID-19, in Australian untreated wastewater (sewage). Researchers found RNA fragments of SARS-CoV2 in untreated sewage which would have been shed in the wastewater stream by COVID-19 infected people.

Understanding in advance where outbreaks may be emerging is critical information for managing public health interventions as Australia relaxes restrictions. This powerful surveillance tool can guide decisions and communications by public health authorities, while ensuring the protection of public health.

03 Our operating environment

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3.5 Portfolio BudgetStatements,Corporate Planand Annual Report

Our Corporate Plan is our key strategic planning document. It is aligned to the Portfolio Budget Statement (PBS), which describes the outcomes, proposed allocation of resources, and our performance. The Corporate Plan outlines our objectives and investments required to deliver on our functions set by the SIR Act and deliver on our purpose stated in the PBS.

Results of our performance against the planned activities and outcomes, stated in this Corporate Plan and the PBS, are provided in our Annual Report.

Portfolio Budget Statements

Budget appropriations are made against the outcomes and programs listed in the PBS

Corporate Plan

Our objectives and functions aligned to our Act over the next four years so we achieve our purpose

Annual Report

Our performance for the year against the PBS and Corporate Plan

*As our key planning document, the Corporate Plan includes the full set of performance measures endorsed by the Board. Generally, only the most critical of these features in the PBS for each PBS program. However, for some programs e.g. National Facilities and Collections, the single performance measure has a number of metrics which are recorded in more detail in our PBS.

Our purpose: solving the greatest challenges through innovative science and technology.

Program 1

Scientific and industrial research, and infrastructure



Performance measures*:

- value of benefits created for Australia
- customer satisfaction
- research valued by academia
- science and technology is adopted and creates value for industry
- effective collaboration with research and development sector
- CSIRO recognised as a trusted advisor
- national benefits of international projects and activities
- strategic investments by SIEF to address national challenges
- CSIRO's contribution in lifting Australia's science capacity
- research community access, as well as effective use of world-class facilities and collections
- staff safety, health and wellbeing
- cultural health.

3.6 How we measure success

Our science aims to deliver our purpose for solving the greatest challenges through innovative science and technology. We actively review and monitor our performance including the use of performance measures as part of our performance framework. Read more about these measures and targets for the next four years under our individual objectives.



Enhancing our positive culture

METRICS

Demonstrated value of benefits underpinned by an increasing annual portfolio of externally validated impact case studies capturing triple bottom line impacts.

Customer Net Promoter Score (NPS) maintained with increased survey sample.

Normalised Citation Index (NCI).

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.

Demonstrated evidence of the value created from deep R&D collaborative relationships with mixed methods including joint publication, formal partnerships and qualitative assessment.

Business Sentiment Survey: awareness of potential to work directly with CSIRO and knowledge of CSIRO.

Demonstrated by an increasing annual portfolio of impact case studies on global activities, with specific assessment of the value created and national benefit.

SIEF invests in programs aligned with published strategic objectives that address national challenges and contribute to Australia's sustainable future.

Demonstrated contribution to national scientific literacy through delivery of STEM programs as evidenced by an annual program evaluation of STEM program delivery.

Facilities and collections achieve a threshold rate of successful usage, with lost time minimised.

Staff Survey: staff wellbeing responses

Hazard reporting (number of hazards recorded by staff in the health, safety and environment system)

Staff Survey: Sustainable Engagement Score

Diversity in leadership: proportion of female leaders (as defined by organisation role)

2020–21 TARGET

Evidence of maintained or increased impact

NPS +40

NCI 1.5

Maintain or increase performance across each method

Evidence of the value created in a collaboration from a mixed methods assessment

Increase year-on-year

Evidence of national benefit demonstrated by case studies

Evidenced by an impact case study or evaluation for each active SIEF program

Evidence of contribution to scientific literacy

Achieve or exceed usage rates

71%

1,080 reports

81%

34%

Solar technology powering electric cars

With more electric vehicles (EVs) on Australian roads, demand for infrastructure is growing and placing stress on grid-powered charging stations. Our new solar-powered EV charging stations are maximising the use of renewable energy, with the potential to alleviate stress on the grid during peak periods.

The charging stations were developed with the Australian household in mind, overcoming difficulties associated with EV charging, including managing temperatures on even the hottest days. The technology also supports charging of multiple vehicles in areas with limited access to grid power – such as home garages and public carparks – where the charge rate would otherwise be limited.

Read more about our work in accessing new opportunities for Australian innovation on pages 38–39.





Objectives and strategic focus areas

Our objectives help us deliver on our purpose and respond to the external and internal environment. They include our key activities that will help us achieve our strategic direction and aspirations for the next four years.



Objective 1

Conduct and encourage the uptake of world-class scientific research.

We deliver on this objective primarily through our Business Units and Future Science Platforms (read more about our Investment in future capability on page 57).

Business Units

- Agriculture and Food
- Data61
- Energy
- Health and Biosecurity
- Land and Water
- Manufacturing
- Mineral Resources
- Oceans and Atmosphere

Future Science Platforms

- Active Integrated Matter
- Artificial Intelligence and Machine Learning
- Deep Earth Imaging
- Digiscape
- Environomics
- Hydrogen Energy Systems
- Precision Health
- Probing Biosystems
- Responsible Innovation
- Space Technology
- Synthetic Biology



1.1 Conduct and facilitate the uptake of excellent scientific and technology solutions to deliver impact to the nation.

We deliver on this requirement by:

- conducting scientific research aligned to the greatest challenges and encouraging or facilitating the application or utilisation of the results
- establishing collaborations and multidisciplinary research partnerships (with public and private sector organisations, other publicly funded research agencies, universities and schools) to integrate the best solution for our customers
- providing products, and technical and advisory services to industry and government including professional consulting and testing facilities.

Strategic focus areas for 2020-24:

- shifting our portfolio towards larger-scale challenges and missions
- investing more in frontier and cross-cutting science that reinvents and creates new industries for Australia
- continuing to strengthen digital capability in CSIRO
- developing strategic R&D partnerships and delivering excellent customer experiences to industry, SMEs and universities.

Key activities for 2020–24: how we will achieve our strategic direction and aspirations

PROGRAM	INITIATIVES	2020–21	2021-22	2022–23	2023–24
Challenges and Digital Transformation Program	Mission program establishment: Announce initial portfolio of missions with anchor partners and investors to demonstrate the value of the collaborative operating model. Continually assess impact of initial missions and add to portfolio to address key national priorities.		•		
	Digital transformation: For organisational transformation, accelerate our Managed Data Ecosystem platform to extract the maximum value from our data and digital assets. We will build capability and mindsets to solve adaptive problems and reposition our workforce for the digital future, and enhance our support areas to optimise services and deliver new value from digital innovation.		•	•	•
Portfolio planning and investment	Improved approach to portfolio management: Assess our existing science portfolio and establish an enhanced cross-organisational portfolio direction and approach with clear milestones and a roadmap required to address national challenges.		•		
	Customer growth and retention: Aid our revenue pipeline growth and financial sustainability in a post-COVID-19 economy through new engagement models, strategic partnerships and larger programs of cross-organisational work.				
Key science programs	Responding to COVID-19: Enhance Australia's disease preparedness against present and emerging infectious diseases by supporting vaccine development, possible treatments and expanding ACDP's zoonotic diseases work and capability.				
	Australia's climate and disaster resilience: Build on work delivered to governments in June 2020 on climate and disaster resilience. We will engage deeply with partner agencies, stakeholders and end users to establish new mechanisms and deliver climate information services and practical science to update resilience and adaptation measures across industry, community and government.		•		•
	State of the Climate report: Deliver the next biennial State of the Climate report with the Bureau of Meteorology. It will draw on the latest monitoring, science and projection information to describe variability and changes in Australia's climate, and how it is likely to change in the future. It is highly likely this will be superseded by updated approaches in the climate and disaster resilience areas in future years.				•
	Great Barrier Reef: Contribute as a major partner to the Great Barrier Reef Foundation's Reef Restoration and Adaptation Program in the governance of the program and the delivery of science in areas relevant to our capability.				
Planning	Implementation	mprovemen	t		

Outcomes

- 1. The application of research benefits the Australian economy, society and environment.
- 2. The provision of timely advice, information, and specific solutions inform and protect society and the environment.
- 3. New knowledge and solutions are available to be used by academia, government and customers.
- 4. Strong relationships with universities and other research organisations enhance Australia's innovation capacity.
- 5. We are trusted as the national science agency and have a reputation for world-class pioneering research.

OUTCOME PERFORMANCE MEASURE	METRICS	2020–21	2021–22	2022–23	2023–24
Impact: value of benefits created for Australia ^a	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	Evidence of maintained or increased impact	Evidence of maintained or increased impact	Evidence of maintained or increased impact
Customers are satisfied, as reported by increased numbers of them ^b	Customer Net Promoter Score (NPS) maintained with increased survey sample.	NPS +40	NPS +40	NPS +40	NPS +40
Research is recognised as excellent, referenced and used by academia	Normalised Citation Index (NCI).¢	NCI 1.5	NCI 1.5	NCI 1.5	NCI 1.5
Science and technology is adopted and creates values for industry	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	Maintain or increase performance across each method	Maintain or increase performance across each method	Maintain or increase performance across each method
Effective collaborative relationships with the R&D sector	Demonstrated evidence of the value created from deep R&D collaborative relationships with mixed methods including joint publication, formal partnerships and qualitative assessment.	Evidence of the value created in a collaboration from a mixed methods assessment			
CSIRO is recognised as a trusted advisor	Business Sentiment Survey: awareness of potential to work directly with CSIRO and knowledge of CSIRO.	lncrease year-on-year	lncrease year-on-year	lncrease year-on-year	lncrease year-on-year

Performance measures and targets

a. Over the years to 2023, the annual portfolios of impact case studies shall increase from 25 to 40 per year and then be maintained to broaden the body of evidence and demonstrate impact.

b. NPS targets are set to 'maintain' current level of results while CSIRO focuses on increasing the number of responses/sample size to further validate the already relatively high result.

c. A standard international metric in the form of an index relative to the global average indicated by 1.0. It represents the rate of citation of CSIRO publications by other authors, normalised by field of publication. A result of 1.50 indicates 50 per cent more citations than the global average in the relevant fields.

Revolutionising how we operate underground

Our BIA5 Titan robot on the Queensland Centre for Advanced Technologies' underground simulation tunnel. The robot is used by our DARPA Subterranean Challenge team to help deploy WiFi nodes and form the main communications trunk for use by other autonomous robots.

1.2 Connect to global science, technology and innovation to access new opportunities, build capability and generate new value and impact for Australian innovation.

We deliver on this requirement by:

- accelerating the overall rates of international engagement, operations and collaboration where there is a higher potential impact value return to Australia than available domestically
- prioritising key regions for sustained presence and development where there is clear intersection with our impact objectives and sustainable business opportunities.

Strategic focus areas for 2020-24:

- enhancing our global reputation as a world-leading research organisation, solving complex multidisciplinary challenges
- establishing CSIRO as a trusted science and innovation advisor and partner to government to support foreign policy agenda
- capturing and drawing innovation and research and development investment back to Australia.

Key activities for 2020–24: how we will achieve our strategic direction and aspirations

PROGRAM	INITIATIVE	2020–21	2021–22	2022–23	2023–24
Capturing global investments	Global strategy (including Regional Team Australia program): Position our global and regional priorities, strengthen strategic partnerships with government to respond to the COVID-19 impacts on the global landscape, address regional challenges, and ensure the greatest impact from our science.				
Planning	 Implementation Continuous i 	mprovemen	t		

Outcomes

- 1. We are recognised as being part of 'Team Australia' in global markets' access to world-class capability and talent.
- 2. Links for our Australian SMEs and domestic university partners to global markets.
- 3. Increased value creation for our innovations and services.

Performance measure and targets

OUTCOME PERFORMANCE MEASURE	METRIC	2020–21	2021–22	2022–23	2023–24
National benefit of international projects and activities ^a	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 by case studies			

a. Over the years to 2022, the annual portfolios of international impact case studies shall increase from 2 to 6 per year and then be maintained to broaden the body of evidence and demonstrate impact with national benefit



Plant-based alternative protein start-up company, v2food, was launched in 2019 by CSIRO, Main Sequence Ventures and Competitive Foods Australia.

In response to increased consumer demand for non-meat alternatives with similar sensory attributes, our researchers helped develop products with meat-like taste and texture. The products are produced from legumes, plant fibre, and sunflower and coconut oils. Our nutritional scientists advised on how to make the products healthier and more nutritious, and we've assessed the environmental impacts of different ingredients to make the most environmentally friendly choices.

v2food's first product was released by Hungry Jack's stores across Australia, and under the Burger King brand in New Zealand. Since then, our researchers have assisted with further product development, and v2food products are also available through home meal-kit services and other food vendors.



1.3 Manage funding directed to industrial scientific research activities, commercialisation of technologies and assistance to industry through research collaboration and capacity building.

We deliver on this requirement by*:

- CSIRO Innovation Fund, managed by Main Sequence Ventures, invests in start-up and spin-out companies, existing SMEs engaged in translation of research, and company formation opportunities to support business growth and a culture of innovation and entrepreneurship in Australia
- Science and Industry Endowment Fund (SIEF) grants to science and scientists for the purposes of assisting Australian industry, furthering the interests of the Australian community and contributing to solving national challenges.

Strategic focus areas for 2020-24:

- stimulating research, innovation and entrepreneurship across the Australian innovation system
- supporting a portfolio of deep technology companies to achieve their long-term goals
- being the investor of choice for Australian deep technology entrepreneurs
- encouraging STEM uptake in education and training, and retaining talent in STEM industries.

^{*} The CSIRO Innovation Fund managed by Main Sequence Ventures and SIEF are independent from CSIRO.

Key activities for 2020–24: how we will achieve our strategic direction and aspirations

PROGRAM	INITIATIVES	2020–21	2021–22	2022–23	2023–24
CSIRO Innovation Fund	Partners and investors: Manage CSIRO Innovation Fund 1 and conduct capital raise from market to build CSIRO Innovation Fund 2 (trading as Main Sequence Ventures).				
SIEF	Australia's sustainable future: Assist the SIEF Trustee to deliver grant programs to support scientific research that addresses national challenges and delivers education programs in STEM education pathways and employment in New South Wales.		•	•	
Planning	Implementation	mprovemen	t		

Outcome

1. Australian industries maintain and improve their competitiveness through the application of new technologies and solutions.

Performance measure and targets

OUTCOME PERFORMANCE MEASURE	METRIC	2020–21	2021–22	2022–23	2023–24
Strategic investments by SIEF in scientific research to address national challenges for Australia	SIEF invests in programs aligned with published strategic objectives that address national challenges and contribute to Australia's sustainable future.	Evidenced by an impact case study or evaluation for each active SIEF program	Evidenced by an impact case study or evaluation for each active SIEF program	Evidenced by an impact case study or evaluation for each active SIEF program	Evidenced by an impact case study or evaluation for each active SIEF program

Objective 2

Mobilise and develop the best talent for the benefit of Australia.

We deliver on this objective primarily through our Services line of business.

• Education and Outreach

- CSIRO Futures
- Infrastructure Technologies

- CSIRO Publishing
- SME Connect

Generation STEM

To equip New South Wales students with the skills they need for the workforce of the future, we're partnering with the New South Wales Government to deliver Generation STEM, a \$25 million initiative to attract, support and retain young people in STEM education and skilled careers.

2.1 Promote STEM capability, development and education.

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We deliver on this requirement by:

- providing opportunities for students and teachers to develop and improve STEM skills including access to mentors
- offering education and outreach activities to increase knowledge of STEM and its application to students, parents, teachers and the Australian community
- publishing a variety of content including journals, books and magazines to support an increased knowledge of science and its application
- working with SMEs to develop capability both within industry and the research sector to support innovation in SMEs.

Strategic focus areas for 2020-24:

- providing high-quality STEM programs for teachers, students and community
- improving Indigenous STEM studies and employment
- enhancing early career researchers' industry engagement
- increasing STEM for SMEs.

Key activities for 2020–24: how we will achieve our strategic direction and aspirations

PROGRAM	INITIATIVES	2020–21	2021–22	2022–23	2023–24
Education and Outreach	Continuous improvement of STEM programs: Renew, refresh and develop an integrated suite of programs to grow Australia's pipeline of STEM talent through high-quality, innovative and authentic STEM education experiences for students, educators, industry, government and the community.	٠			
SME Connect	Increase SME engagement: Deliver the Innovation Connections program and develop an integrated offering for SMEs which builds on existing programs and boosts the innovation performance of Australian SMEs to drive economic growth and productivity by increasing SME engagement with publicly funded research and development.	•			•
Planning	Implementation Continuous in	mprovemen	t		

Outcomes

- 1. Australia's science capacity is increased, which helps the nation to remain innovative and competitive in science.
- 2. Increased awareness and understanding of science and its potential benefits to the community and industry.
- 3. Increased industry participation in CSIRO education and outreach activities.

Performance measure and targets

OUTCOME PERFORMANCE MEASURE	METRIC	2020–21	2021-22	2022-23	2023–24
CSIRO's contribution to help lift Australia's science capacity and capability through STEM funded, developed and delivery of education programs	Demonstrated contribution to national scientific literacy through delivery of STEM programs as evidenced by an annual program evaluation of STEM program delivery.	Evidence of contribution to scientific literacy	Evidence of contribution to scientific literacy	Evidence of contribution to scientific literacy	Evidence of contribution to scientific literacy

Objective 3

Manage national research infrastructure for the nation.

We deliver on this objective primarily through our facilities and collections.

- Australian Centre for Disease Preparedness
- Australia Telescope National Facility
- Marine National Facility

- Pawsey Supercomputing Centre
- National Research
 Collections Australia
- Atlas of Living Australia and associated bio-collections



3.1 Ensure utilisation of national facilities and collections.

We deliver on this requirement by:

- hosting world-class science-ready research facilities and biological collections available for use by the national and international science community across government, academia and industry
- advising on the identification of facility needs and the design and creation of new national infrastructure.

Strategic focus areas for 2020-24:

- maintaining Australia Telescope National Facility (ATNF) leadership and operation of the Square Kilometre Array (SKA), international partnerships and collaborations in space and astronomy
- maintaining supercomputing leadership for Australia and creating a recognised Asian supercomputing zone.

Key activities for 2020–24: how we will achieve our strategic direction and aspirations

PROGRAM	INITIATIVES	2020–21	2021–22	2022–23	2023–24
Deep space	Deliver the SKA site and technical operations for Australia: Maintain leadership and deliver operations under contract as the SKA site and operations entity in Australia including partnering with industry, science organisations and local and international governments.		•	•	•
Pawsey	Deliver the \$70 million technical upgrade of Pawsey's supercomputers: Implement the upgraded supercomputing infrastructure and meet the expected needs of Pawsey's users over the next four years including for the Australian Square Kilometre Array and Murchison Widefield Array telescopes, and the SKA.	•			
Planning	 Implementation Continuous i 	mprovemen	it		

Outcome

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

Performance measure and targets

OUTCOME PERFORMANCE MEASURE	METRIC	2020–21	2021–22	2022–23	2023–24
World-class facilities and collections are made available for access by the research community and used effectively	Facilities and collections achieve a threshold rate of successful usage, with lost time minimised.	Achieve or exceed usage rates	Achieve or exceed usage rates	Achieve or exceed usage rates	Achieve or exceed usage rates

Objective 4

Ensure the sustainability of CSIRO.

We deliver on this objective primarily through our Enterprise Support Services.

- Global
- Business Development and Commercial
- Strategy
- Finance
- Business and Infrastructure Services
- Corporate Affairs

- Information Management and Technology
- Governance
- Human Resources
- Organisational Development
- Health, Safety and Environment
- Science Impact and Policy

Our committed and dedicated people Our people are our greatest asset. There's nothing more important than ensuring everyone feels safe and able to do their best work – and we believe we all have a responsibility to look after ourselves, our colleagues and our workplaces. We've expanded our health, safety and environment footprint and moved to a site-based approach that recognises and responds to the diverse risks of the work that we do.

4.1 Ensure a vibrant, safe and positive culture in CSIRO.

We deliver on this requirement by:

- understanding our future workforce needs and ensuring we have the right capabilities (including leadership) at the right time
- supporting our people to thrive and to value their health, safety and wellbeing
- shifting the needle on all elements of our cultural vision and continuing to invest in our leaders
- attracting, developing and retaining the nation's best and brightest to solve complex, emergent challenges for Australia's prosperity into the future.

Strategic focus areas for 2020-24:

- caring for our people's safety and the environment so that everyone thrives and goes home safely
- building our capability to deliver on our strategy now and for the future
- nurturing and attracting world-class talent for CSIRO and Australia, and creating a people experience that delights
- developing outstanding leadership and building a culture to support our purpose and vision.

Key activities for 2020–24: how we will achieve our strategic direction and aspirations

PROGRAM	INITIATIVES	2020–21	2021–22	2022–23	2023–24
Safety and culture	Health, Safety and Environment Management Culture and System: Establish a single system as a seamless part of how we do business. A proactive, fit-for-purpose risk management culture and consistent processes and standards will embed health and safety within our vibrant culture.				
	Refresh culture plan including wellbeing and values: Refresh our culture plan for a proactive, holistic approach to our values and employee health and wellbeing to support and enable our people to thrive at work.	•			
Capability	CSIRO Workforce strategy including interchange: Establish and embed a strategy for our workforce to understand how to best access, develop, engage and internally mobilise our people so we can achieve our purpose and vision.				
	New ways of working: Establish more flexible and agile ways of working by providing our people with improved remote working arrangements, enhanced digital tools and platforms, and modern (including virtual) laboratories and meeting spaces.				
Planning	Implementation Continuous in	mprovemen	t		

Outcomes

- 1. Our people are engaged and empowered in their work.
- 2. Our innovation culture and operations enhance the wellbeing of our people.
- 3. Our workforce is inclusive, harnessing the full potential of our people.

Performance measures and targets

OUTCOME PERFORMANCE MEASURE	METRICS	2020–21	2021–22	2022–23	2023–24
Staff safety, health and wellbeing	Staff Survey: staff wellbeing responses	71%	72%	73%	74%
	Hazard reporting (number of hazards recorded by staff in the health, safety and environment system)	1,080 reports	1,440 reports	1,800 reports	1,800 reports
Cultural health	Staff Survey: Sustainable Engagement Score	81%	81%	82%	82%
	Diversity in leadership: proportion of female leaders (as defined by organisation role)	34%	35%	36%	37%

Lowering the cost of solar thermal research power

Solar thermal offers a number of benefits over other renewable energy technologies, but it is yet to reach the cost levels of wind, hydro or photovoltaic power stations.

We have partnered with six Australian universities and the United States' Department of Energy's National Renewable Energy Laboratory, Sandia National Laboratories and Arizona State University, with the goal of creating solar technology to supply cheap, zero emission, secure energy for Australia, and the world.

Our team is developing a set of relevant standardised measurements and models for Australian conditions enabling accurate and informed commercialisation decisions to be made.

1



4.2 Ensure CSIRO has sustainable operations, sites and infrastructure.

We deliver on this requirement through finance, governance, information management, property and corporate affairs services to support research and innovation activities, protect our brand, and strengthen our reputation with key stakeholders.

Strategic focus areas for 2020-24:

- continually improve our ability to strategically allocate resources and monitor for agility
- adapting to the impact of COVID-19 and building future agility and resilience
- developing secure and effective systems and platforms to underpin our science.

Key activities for 2020–24: how we will achieve our strategic direction and aspirations

PROGRAM	INITIATIVES	2020–21	2021–22	2022–23	2023–24
Security	2020–21 Security Action Plan: Focus on developing a strong security culture to enable adequate protection of our people, information and assets. Internally, this will include access to eLearning security modules and assessment procedures, increased engagement between support services, improved assessment tools and awareness raising activities. Externally, the plan will include increased engagement with security agencies and adopting learnings from others.				
Property	2020–21 Property Plan: Develop, implement and report on the annual property plan, including addressing the recommendations of Australian National Audit Office's performance report.				
Operations	Increased agility of our operations: Enhance the agility and resilience of our operations to manage disruptions such as COVID-19 on our people, customers and governance so we continue to deliver impact for Australia.				
Planning	 Implementation Continuous i 	mprovemen	t		

Outcome

1. We have efficient and sustainable operations and are able to move quickly to address opportunities, thus maintaining our capacity to innovate for Australia.

Performance measures and targets

Please refer to the Business Sentiment Survey and Customer Net Promoter Score performance measures on page 37.

Artificial Intelligence transforming Kakadu management

Kakadu National Park presents a difficult environment for data collection due to its extreme weather conditions.

We are partnering with Microsoft, Indigenous rangers, Parks Australia, Northern Australia National Environment Science Program, University of Western Australia, Charles Darwin University and Kakadu National Park to mix responsible Artificial Intelligence (AI) and modern science with traditional knowledge. Under the direction of Indigenous rangers, drones are being used to capture video footage. Data is collected, labelled and interpreted using a combination of Indigenous knowledge, Microsoft AI, CustomVision AI from drone footage, data visualisation, and scientific research to help solve complex environmental management problems. The AI is removing the need for people to physically collect and then review thousands of hours of video to count animals like magpie geese, and identify invasive weeds, like para grass.

Magpie geese are a key indicator of 'healthy country' and an important food source for Bininj. Collecting and analysing information about magpie geese and para grass using drones and AI is a game-changer for the rangers and their decision-making processes. And the results are promising: thanks to the rangers' work, thousands of magpie geese are returning to roost.





Capability

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



5.1 Staff numbers

Our extraordinary people are critical to our success and bring our excellent science to life. We have people working across the entire spectrum of research, science and commercialisation, as well as support services.

Our average staffing level is anticipated to remain within a narrow variation range over the strategy period. Based on indefinite, term and casual employees, at 30 June 2020 we had 5,319 people, a full-time equivalent of 5,065. Of these, 3,168 full-time equivalent or 63 per cent, were classified within the research function.

AVERAGE STAFFING LEVELS	2017–18	2018–19	2019–20	2020–21
Total average staffing levels full time equivalent	5,094	5,239	5,193	5,250



New ways of working

The wellbeing and vitality of our people is our number one priority. To build agility and to manage risks and disruptions, such as COVID-19, our new ways of working stream is making sure our dispersed workforce and partners have the physical and virtual tools and platforms they need to collaborate effectively.

Some of our initiatives include: new online wellbeing and leader support programs; more flexible work hours to allow for greater balance and international collaboration; emerging technology that is safe and secure from cyber risks; and modern, virtual labs and meeting spaces that support remote working and reduce our property footprint.



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5.2 Investment in future capability

Over the next four years, we will invest in our people, infrastructure and data capabilities aligned to our strategic pillars and build on existing activities that underpin our objectives and purpose.

Customer focus

Customer engagement skills

Build tactical skills, capability, and maturity with a focus on improved customer engagement, management of business relationships and opportunities, and delivery of customer value.

Customer experience program

The program continues to focus on improving the people, processes, and information technology systems that can impact a customer's experience with us. This includes enhancement of the customer relationship management system to identify industry trends, and plan and implement industry engagement around the challenges.

Thriving people and teams

Equip people for a digital future

Connect and build digital awareness, mindsets and capability within CSIRO. Empower people to operate effectively and improve our ability to solve increasingly complex and adaptive problems.

Building innovation capability within and beyond CSIRO

Boost the early career researchers' pipeline by growing the existing talent pool of approximately 1,000 students and 270 postdoctoral fellows and explore enhanced pathways between postgraduate studentships, postdoctoral fellows and the transition to more senior research roles.

CSIRO Workforce strategy

Establish and embed a strategy for our workforce to understand how to best access, develop and engage our people so we can achieve our purpose and vision.

New ways of working

Establish more flexible and agile ways of working by providing our people with improved remote working arrangements, enhanced digital tools and platforms, and modern (including virtual) laboratories and meeting spaces.

Collaborative networks

Digital Academy

Connect and build digital awareness, mindsets and capability within CSIRO and empower people to operate effectively and improve our ability to solve increasingly complex and adaptive problems.

Industry PhD

The industry-focused research training program is rolled out with university and industry partners to shape the future of industrial research training in Australia and improve our nation's innovation capacity.

Switch 2.0

Provide a pathway that supports and improves our engagement and collaboration with local and international industry, government and research partners.

Solutions from science

Future Science Platforms

These multidisciplinary investments are reinventing existing industries, creating new industries for Australia and turning challenges into opportunities where innovative science and technology is breaking through seemingly impossible problems to improve Australia's prosperity and sustainability. Our Future Science Platforms:

- Active Integrated Matter
- Artificial Intelligence and Machine Learning
- Deep Earth Imaging
- Digiscape
- Environomics
- Hydrogen Energy Systems
- Precision Health
- Probing Biosystems
- Responsible Innovation
- Space Technology
- Synthetic Biology

Future Science and Technology

The CSIRO Future Science and Technology plan provides guidance on what science and technology capabilities we need to develop to maximise the changing world of science. These 10 key transformative cross-cutting capabilities will enable us to shift towards digital and delivery, and ensure we have leading science and technology:

- Genomics
- Synthetic biology
- Artificial Intelligence and Machine Learning
- Robotics, Internet of Things and Sensing
- Simulation and modelling
- Advanced materials
- Engineering
- Quantum technologies
- Indigenous knowledge and science
- Social science and user experience

ResearchPlus CERC Postdoctoral Fellowships

Our CSIRO Early Research Career (CERC) Postdoctoral Fellowship program is developing the next generation of leaders in the innovation system. These Fellowships enhance the person's research capability so that they are better able to pursue a career in research at CSIRO or beyond. We provide a differentiated learning and development program with specially developed programs tailored to facilitate career development.

Managed Data Ecosystem

Build a data ecosystem based on the Findable, Accessible, Interoperable and Reusable (FAIR) data management principles, initially for CSIRO but as an exemplar for and with input from the national research community.

Australian Centre for Disease Preparedness

Increase the laboratory capacity and build related infrastructure for zoonotic diseases in order to enhance Australia's disease preparedness and to help protect the general public from emerging infectious disease threats.

Australia's first current Good Manufacturing Practice (cGMP) facility

Build Australia's first collaborative worldwide accredited laboratory for rapid and cost-effective protein production and scaling-up vaccine and drug candidates.

National Industry 4.0 Testlab

In collaboration with Swinburne University of Technology, establish the innovative Industry 4.0 Testlab to improve the competitiveness of Australian manufacturing industries through the adoption of Industry 4.0 technologies and workforce transformation. The facility will be a pilot plant for 3D printing carbon fibre composite materials.

Square Kilometre Array (SKA)

Continue to design and develop the SKA radio telescope and deliver operations under contract as the SKA site and operations entity in Australia.

Pawsey

Deliver the technical upgrade of Pawsey's supercomputer capability and meet the expected needs of Pawsey's users over the next four years including for the Australian Square Kilometre Array and Murchison Widefield Array telescopes.

National benefit from global engagement

Global compliance, risk and cultural competencies

Strengthen capability in our people to operate in global markets, maintaining compliance with relevant Australian and international, polies, procedures and laws, to increase our people's capability to engage with overseas markets, particularly across the Indonesia-Pacific region. We will share knowledge about working and engaging globally through communities of practice to reduce risk and improve operational effectiveness.

Building the world's largest radio telescope

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To answer the biggest questions in astronomy, you need the biggest and most advanced telescope. We are a key Australian partner in an international effort by 15 countries to build the Square Kilometre Array (SKA). The SKA project is uniquely distributed, with headquarters in the United Kingdom and two telescopes located in Australia and South Africa. The Australia-based telescope, SKA-Low, will be an array of 131,000 low-frequency antennas, designed to probe the dawn of the Universe. Prototype antennas are currently being tested on site by an international consortium led by Curtin University at our Murchison Radio-astronomy Observatory in Western Australia (pictured). In preparation for construction, we're working with scientists and engineers in industry and research institutes worldwide, testing and fine-tuning SKA technologies and infrastructure. The SKA telescope will be the first global mega-science project to be hosted by Australia. When built, the SKA will enable transformational science. We acknowledge the Wajarri Yamatji as the traditional owners of the Murchison Radio-astronomy Observatory.

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Cotton research from seed to shirt

Australian cotton farmers are constantly looking to improve profitability through increases in crop yield and fibre quality traits. They are also concerned with sustainability – crop water use, nutrition and pest management. In addition, as spinning and weaving machines change, farmers need to grow cotton varieties that produce fibre suitable for these new technologies to remain competitive with synthetic fibres.

Our cotton research in Narrabri, Canberra and Geelong is improving the sustainability, productivity, fibre quality and distinctiveness of the Australian cotton crop through the development of high-performing varieties, matching crop management strategies, improved post-harvest fibre processing technologies, and developing value-added co-products.

Australia has the highest cotton yields in the world, exporting around \$2 billion of cotton each year. We have proudly contributed to this ranking through our breeding program, and through improved crop practices that manage pests and their resistance to pesticides while striving to ensure a responsible use of Australia's land and water.





Appendix



List of requirements index

The corporate plan has been prepared in accordance with the requirements of:

- subsection 35(1) of the PGPA Act
- the PGPA Rule 2014.

These are the required sections and the page reference(s) that show how our corporate plan meets these expectations.

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As Australia's national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology.

CSIRO. Unlocking a better future for everyone.

Contact

1300 363 400 +61 3 9545 2176 csiroenquiries@csiro.au csiro.au