

**Australian Government** 

# Australia's National Science and Research Priorities

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#### Acknowledgement of Country

Our department recognises the First Peoples of this Nation and their ongoing cultural and spiritual connections to the lands, waters, seas, skies, and communities.

We Acknowledge First Nations Peoples as the Traditional Custodians and Lore Keepers of the oldest living culture and pay respects to their Elders past and present. We extend that respect to all First Nations Peoples.



#### The artwork

#### Title: 'A Cultural Synergy'

Crafted by Lawson 'Wukawe' Dodd for the Department of Industry, Science and Resources (DISR), 'A Cultural Synergy' is a digital vector artwork symbolising the integration of Aboriginal and Torres Strait Islander knowledge into Australian culture, economy, and science. Traditional symbols and contemporary design convey the essence of collaboration, featuring large circular meeting places at the core, representing diverse communities uniting to share culture, knowledge, and resources.

Arch-like shapes surrounding these circles highlight the significance of collaborative research, while journey lines interconnect them, illustrating the fusion of First Nations wisdom with Western scientific resources. The vibrant background, showcasing various colours and textures, mirrors the rich history of science across cultures, reflecting the shared effort between First Nations knowledge and Western science. Structured as a left-to-right journey, the artwork depicts the evolution of science, with dramatic branches reaching out to connect with First Nations communities and integrate their knowledge into the broader narrative of Australian science progress. 'A Cultural Synergy' is a visual celebration of unity, embodying the harmonious blend of cultural heritage and scientific advancement.

## Introduction

Australia is a powerhouse of science and research. Our record of discovery and achievement is oversized in comparison to our population. That record began 65,000 years ago with Aboriginal and Torres Strait Islander peoples, Australia's first scientists. Their unbroken connection to the lands, waters and skies of Australia is a source of deep knowledge unique in the world. Our multicultural diversity, geopolitical stability and world-class education sector make Australia one of the world's leading destinations and collaborators for science and research.

Science and research are essential to Australia's future economic growth, national interest and social cohesion. It is critical that world-class science and research, focused on the needs of Australian society, thrives in Australia. Science and research underpin the government's ambition to drive a dynamic economy, provide well paid jobs, improve our quality of life, preserve our unique environment and build a Future Made in Australia.

Science and research will help Australia thrive in a changing world. New discoveries will support Australia's transition to a net zero economy, as well as how we develop and use digital technologies. Science and research will also help to provide for the needs of an ageing population, protect our environment and help us navigate a complex geopolitical landscape.

By investing in science and research, and promoting collaboration between research organisations and businesses, Australia can improve its economic complexity and position itself as a leader in high-value industries.

- Cooperative Research Australia

# Delivering on the National Science and Research Priorities

The revitalised National Science and Research Priorities (the priorities) will guide Australian science and research efforts. They recognise matters that are important to Australians and how Australia can uniquely contribute to global research. They are challenge-based, overlapping, and cut across discipline, sector and knowledge system boundaries.

The priorities will help the Australian Government align its effort and investments in the science, research, technology, innovation and commercialisation system. The priorities will also help to shape investment and efforts across the university and private sectors. They provide focal points towards which researchers from across research and innovation can concentrate their combined efforts to help solve Australia's greatest challenges.

The priorities are relevant not only to university and government research institution activity, but also in Australia's industries and businesses, which must be encouraged to look to the priorities as a first indication of how to diversify their R&D.

– Group of Eight universities

# The National Science and Research Priorities

The priorities are:

- transitioning to a net zero future
- supporting healthy and thriving communities
- elevating Aboriginal and Torres Strait Islander knowledge systems
- protecting and restoring Australia's environment
- building a secure and resilient nation.



#### Figure 1. The overlapping nature of the National Science and Research Priorities.

Each priority includes outcomes to work towards in the next 10 years. We have also identified critical research needed in the next 5 to 10 years to achieve these outcomes.

#### Priority 1: Transitioning to a net zero future

#### Where we want to be

Science and research will help Australia take the technological leaps needed to achieve a net zero economy by 2050, with emissions levels 43% below 2005 levels by 2030. We will develop and use new technologies, materials and processes to change energy generation and storage, heavy industries and agriculture. Australia will transition to a circular economy, turning waste into opportunity. Australia's workforces will develop the skills they need to do the jobs of the future, including through a strong vocational and higher education system.

Decarbonising Australia's energy system is a significant challenge and urgent action is required on multiple fronts ... Timing is critical and driving innovation through increased science and research will be key. – Future Energy Exports Cooperative Research Centre

Almost every societal challenge has at its core the requirement for new, advanced materials to meet that challenge. – Monash University

#### Science and research outcomes

To get where we want to be, we need science and research to work towards these outcomes:

- a transition to net zero by creating emissions reduction, removal and storage technologies and practices
- eliminating or managing the environmental impacts of emissions reduction, removal, and storage technologies
- shifting towards a circular economy through advanced materials and processes
- globally leading zero or low-emissions industries that harness emerging technologies at scale
- increasing economic benefits from the transition to net zero for Aboriginal and Torres Strait Islander communities, and drawing on their expertise in adapting to and mitigating climate change<sup>1</sup>
- greater workforce participation, adaptability and responsiveness through new approaches to lifelong learning.

#### **Critical research**

- new and innovative renewable energy, grid infrastructure, grid integration and storage systems
- mitigating the environmental impacts of efforts to decarbonise industries and infrastructure
- perceptions, beliefs, barriers and incentives regarding adopting and applying new technologies
- approaches to partnering with Aboriginal and Torres Strait Islander communities to share the economic benefits of emissions reduction projects that occur on Country
- technological solutions for sustainably reducing, reprocessing and recycling Australia's waste at scale
- new and innovative ways of extracting, refining and processing critical minerals while minimising environmental impact
- solutions for removing carbon dioxide from the atmosphere at scale and for hard-to-abate processes and activities such as agriculture
- advancing critical technologies such as artificial intelligence (AI), quantum and robotics to allow us to transition to net zero in environmentally responsible ways
- information, skills training and skills uptake of workers who support the transition to a net zero economy.

<sup>&</sup>lt;sup>1</sup> In alignment with socio-economic targets 8 and 17 under the National Agreement on Closing the Gap.

#### Priority 2: Supporting healthy and thriving communities

#### Where we want to be

Scientists and researchers will work with communities and individuals to develop the technologies, tools and techniques for more Australians to enjoy healthier lives from birth well into old age. New treatments, medicines and therapies will help the healthcare system to better adapt to and support our ageing population. The Aboriginal and Torres Strait Islander concepts of 'healthy Country, healthy community' can play a role in achieving this vision. Australia's healthier population will reduce pressure on our health and aged care systems and benefit our economy. Australians with disabilities will benefit from advanced technologies and societal supports.

Science can help to improve health outcomes through research and development of new medicines, treatments, and technologies.

- Business Council for Sustainable Development Australia

There are opportunities to leverage Australian research strength in health and biotechnology, move towards more preventative healthcare, and improve patient education.

– Australian Academy of Technological Sciences and Engineering

#### Science and research outcomes

To get where we want to be, we need science and research to work towards these outcomes:

- improved physical and mental wellbeing indicators (including disability indicators) with integrated, holistic approaches to care and support
- improved preventive health through new screening, diagnostic and treatment techniques and models of care
- equitable health outcomes for Aboriginal and Torres Strait Islander people, particularly in life expectancy, infant and child health, and social and emotional wellbeing<sup>2</sup>
- improved community health by better understanding the diverse social and environmental determinants of physical and mental health in Australian communities.

#### **Critical research**

- social, cultural, developmental and environmental drivers of individual and community health, particularly in infancy and childhood, and approaches to improve them at scale
- anticipating and responding to future pandemics and infectious disease outbreaks
- healthcare literacy and motivators for behavioural change
- technological and social solutions to providing services and diagnostics for aged care, people with disability and people living in regional and remote communities
- technologies and techniques that support an affordable, inclusive, culturally appropriate, and integrated preventive health system in Australia
- therapies that use precision medicine to treat diseases
- Aboriginal and Torres Strait Islander-led, place-based and culturally appropriate approaches to build community capacity and achieve equity for Aboriginal and Torres Strait Islander peoples in health, wellbeing and life expectancy
- likely impacts of climate change on communities' physical and mental health.

<sup>&</sup>lt;sup>2</sup> In alignment with socio-economic targets 1, 2, 4 14, 15 and 17 under the National Agreement on Closing the Gap.

# **Priority 3:** Elevating Aboriginal and Torres Strait Islander knowledge systems

#### Where we want to be

Australia celebrates the deep history and knowledge systems embedded in Aboriginal and Torres Strait Islander peoples, cultures and Countries. Aboriginal and Torres Strait Islander peoples well-established and sophisticated systems for trading knowledge are preserved.

The science and research system will evolve to protect and elevate Aboriginal and Torres Strait Islander knowledges. It will build practices that can weave in Aboriginal and Torres Strait Islander knowledges. It will position Aboriginal and Torres Strait Islander peoples to lead research that affects them – as community leaders, traditional knowledge holders or researchers.

Indigenous and Western scientists provide diverse and often complementary approaches to knowledge gathering and interpretation of the natural environment. Yet to date, there have been few opportunities for Indigenous scientists to work with Western scientists and have their knowledge seen as equal. This acknowledgment and interaction would allow both to understand each other's knowledge systems and methodologies and to share them, benefitting the scientific community more broadly, and Australia.

– Professor Bradley J. Moggridge

Australia can take a leadership role in the recognition, valuing and advancement of Indigenous Knowledge systems.

– Professor Barry Judd

#### Science and research outcomes

To get where we want to be, we need the science and research system to work towards these outcomes:

- research that affects or draws from Aboriginal and Torres Strait Islander knowledge and knowledge systems is done in collaboration with Aboriginal and Torres Strait Islander people
- policy to improve the lives of Aboriginal and Torres Strait Islander people is shaped by science, research and strong partnerships with Aboriginal and Torres Strait Islander peoples and their communities
- a science and research system that is culturally safe
- respect for, preservation and protection of Aboriginal and Torres Strait Islander traditional knowledges, language, data sovereignty, cultural expressions and other intellectual property.

#### **Critical research**

To achieve these outcomes, we need research that addresses:

- incorporating Aboriginal and Torres Strait Islander knowledge into the development and application of critical and emerging technologies, particularly digital and data technologies
- approaches for protecting and managing Aboriginal and Torres Strait Islander cultural and intellectual property
- approaches to preserving language and promoting bilingual education
- approaches to climate change adaptation to support regional and remote communities.

To achieve the best outcomes, Aboriginal and Torres Strait Islander peoples should guide research.

Supporting leadership means supporting Aboriginal and Torres Islander people to thrive through the education system – from early learning through to research careers.



#### Priority 4: Protecting and restoring Australia's environment

#### Where we want to be

We will harness the potential of Australia's science and research system to protect our unique environments from the impacts of climate change and other threats. Australia will use advances in knowledge and techniques to monitor, restore and preserve biodiversity, landscapes and ecosystems. Genuine and appropriate partnerships between Aboriginal and Torres Strait Islander people, scientists and researchers will improve Australia's protection and management efforts. A rich biodiverse environment will support thriving healthy communities and our transition to net zero.

Science can help to understand the impacts of climate change on natural systems and develop adaptation strategies to minimise their effects.

– Ecological Society of Australia

It is increasingly widely recognised that historical approaches to protection and restoration will not be adequate to halt or reverse biodiversity decline in Australia or worldwide.

– Australian Marine Sciences Association

#### Science and research outcomes

To get where we want to be, we need science and research to work towards these outcomes:

- more effectively managing marine, freshwater and terrestrial habitats as multiple-use systems
- improved collection, interpretation and sharing of environmental monitoring data to help make environmental and climate-related decisions
- improved prediction of Australia's ecosystems and biodiversity conditions
- better stewardship of land, sea and freshwater environments including through Aboriginal and Torres Strait islander-led approaches
- better climate change mitigation through harnessing natural systems and Aboriginal and Torres Strait Islander-led Caring for Country.

#### **Critical research**

- past and likely future climate conditions in Australia, our coasts, neighbouring regions and Antarctica. These include tipping points, shifting weather patterns, extreme events and sea level rise
- predicting ecosystem and biodiversity changes caused by climate change and human actions
- new and innovative approaches to discovering, protecting and restoring biodiversity
- effective partnerships and benefits sharing when using Caring for Country and Sea Country in environmental management regimes
- tools and techniques to collect and analyse environmental data
- cumulative impacts of extractive and non-extractive uses of freshwater and marine resources
- transitioning to a more circular economy
- carbon sources and sinks in soils, vegetation, coasts and oceans in Australia and neighbouring regions. These include practical ways to manage carbon drawdown through natural processes and Aboriginal and Torres Strait Islander practices.

#### Priority 5: Building a secure and resilient nation

#### Where we want to be

Through research, Australia will strengthen its democratic institutions and freedoms while addressing challenges from foreign interference, mis- and disinformation, and polarisation. Australia is ready for and able to respond to shocks caused by climate change, natural disasters, geopolitical tensions, rapid technology changes and more competition for resources and supply chains.

Disaster preparedness and resilience requires interdisciplinary research and interventions to reduce risk of mortality, damage to critical infrastructure, and economic loss.

- Australian National University

Australians must be enabled to make use of new and emerging technologies, navigate the deluge of new information, counter misinformation, and critically assess risks and opportunities.

– Inspiring Australia State & Territory Networks

#### Science and research outcomes

To get where we want to be, we need science and research to work towards these outcomes:

- national resilience to the impacts of geopolitical competition and supply chains
- strengthened community trust in our democratic institutions and systems to build resilience to foreign interference and global shocks
- secure water supplies and food production in the face of climate change, weather extremes and biosecurity threats
- increased security and resilience of our critical infrastructure and democratic institutions, including to cyber threats
- cost-effective built environments (such as housing) that are more resilient to climate change and natural disasters.

#### **Critical research**

- secure and resilient technologies, including dual-use technology
- secure and resilient supply chains that underpin Australia's prosperity
- technologies that support Australian resilience to natural and human-induced challenges
- technology design frameworks (including for artificial intelligence) that increase democratic resilience and reduce risks to social cohesion, economic prosperity and national security
- cognitive and social causes of engaging with misinformation and disinformation, and best practices for reducing their impact
- technologies for managing water and producing food under likely future Australian climate conditions
- predicting, detecting and responding to biosecurity threats and natural disasters
- planning, design, materials and engineering of infrastructure and built environments for Australia and our region that account for likely future climate conditions.

## **Guiding principles**

These priorities align with 7 principles the government set to guide their development.

#### Be community-informed

The first phase of the national conversation received 313 written submissions from people and organisations.

Australia's Chief Scientist engaged with the community, research, and industry sectors at more than 30 roundtables across the country and online. A further 23 workshops helped us refine the draft priorities.

The second phase of consultation invited feedback on draft priorities and input to inform the statement. It received more than 170 written submissions.

#### Be ambitious and purpose-driven

The community-informed priorities identify the major challenges and opportunities Australia will face now and in the coming decades. They show industry and the research sector the direction we must take over the next decade to have a meaningful impact.

#### Be evidence-based

The priorities were informed by:

- community input through the national conversation
- expert advice
- existing government priorities.

#### Be enduring and responsive

The outcomes have a time horizon of 10 years. Critical research has a time horizon of 5 to 10 years, which we can adjust in response to new information.

#### **Be relevant**

A review of the priorities will occur every 5 years to:

- monitor progress
- adjust priorities if needed, to ensure they remain relevant
- harness new opportunities.

#### **Be focused**

The 5 priorities reflect the major societal domains with the biggest challenges and opportunities.

The outcomes identify the areas of each priority where science and research can contribute significant knowledge.

The critical research identifies major knowledge gaps we need to address for maximum impact and societal benefit.

#### Inform investments

The priorities will help guide government policy and investment in science and research. However, they are not the only way of doing this.



### Acknowledgements

The research sector, industry, not-for-profits, communities and government organisations contributed more than 1,300 hours to shape and refine these priorities in workshops and meetings. This does not count the time devoted to considering and writing submissions and other feedback.

The Australian Government thanks everyone who has taken the time and effort to engage in the national conversation, from written submissions to roundtables and workshops.



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