

SCIENCE & TECHNOLOGY AUSTRALIA

POLICY SUBMISSION

29 SEPTEMBER 2023

RESPONSE TO THE DRAFT NATIONAL SCIENCE AND RESEARCH PRIORITIES

Science & Technology Australia is the peak body for the nation's science and technology sectors, representing 144 member organisations and more than 115,000 STEM experts and entrepreneurs. We connect science and technology with governments, business and the community to advance science's role in solving some of humanity's greatest challenges.

STA thanks Australia's Chief Scientist and the Department of Industry, Science and Resources for this opportunity to respond to the draft National Science and Research Priorities.

Key Points

- **Indigenous knowledges must be a standalone priority and interwoven into the other national science and research priorities. Both are imperative.**
- **Discovery research should also be a priority – it builds new knowledge that drives all innovation and development and is fundamental to Australia's national wealth.**
- **Australia's National Science Statement and National Science and Research Priorities should be bold statements of ambition and a clarion call to urge many more Australians to study and work in science, technology, engineering and maths.**
- **The Statement and priorities should set out to change Australia's cultural relationship with science, putting science and technology front and centre in the national consciousness as the drivers of every advance on which future Australian jobs, economic growth, health and wellbeing will rely.**
- **They should declare a vision to make Australia a global STEM superpower – and set big national challenges for our nation's science and technology community to solve.**

Introduction

The final priorities should start with a short and compelling opening statement of intent to give context for these grand challenges. This needs to capture:

- The critical imperative to set Australia up to meet the challenges of coming decades.
- The geostrategic importance of research and how a strong research sector establishes Australia as a leader for science diplomacy and international collaboration.
- The importance of discovery research: it is indispensable to achieve each of the priorities.
- The importance of supporting Australia's research capability across the spectrum, from discovery through to translation and commercialisation and its ultimate societal impact.
- The need for these priorities to speak to strategic and policy frameworks across the whole of government.
- The importance of science and research to Australia because they drive:
 - stronger productivity

- strong and sustainable economic growth
- new job creation
- better health, environment and national wellbeing.

The statement, as well as the priorities themselves, must speak to Australia's research community as well the broader Australian population on the significance of research and its critical role in the nation's wellbeing and economic prosperity.

The priorities must be challenges the entire research community can rally around, that government can clearly align to policy and that the Australian community identifies with – and benefits from.

Many of the challenges articulated in the priorities are equally dependent on effective Government policy designed drawing from evidence generated by research. This is a critical issue: the priorities should clearly be seen as – and be – a guide for government policy that relies on research, just as they are guide for the nation's researchers.

The imperative to invest in Indigenous knowledges as its own priority

The following section has been drafted in partnership with Aboriginal and Torres Strait Islander research leaders, organisations and formal representative structures including:

- **Associate Professor Bradley Moggridge** Kamilaroi water scientist, Chair: National Indigenous STEM Professionals Network, and President of the Australian Freshwater Science Society.
- **Professor Alex Brown**, CSIRO Board Director and Professor of Indigenous Genomics at the Telethon Kids Institute and The Australian National University.
- **Professor Chris Matthews**, Chair of the Aboriginal and Torres Strait Islander Mathematics Alliance and Science & Technology Australia Board Director
- **Professor Michelle Trudgett** as chair of Universities Australia's Deputy Vice Chancellors (DVC) /Pro Vice Chancellors (PVC) Indigenous Committee (the representative body for Indigenous DVC/PVC leaders nationwide) and DVC Indigenous Leadership Western Sydney University.
- **Professor Ian Anderson**, Deputy Vice-Chancellor (Academic) at the University of Tasmania
- **Associate Professor Sadie Heckenberg** as Chair of the National Aboriginal and Torres Strait Islander Higher Education Consortium (the formal representative body for Aboriginal and Torres Strait Islander staff in universities nationwide)
- **Associate Professor Corey Tutt OAM**, founder and CEO of Deadly Science
- **Toni Hay**, founder of Indigenous Climate Change
- **Dr Katrina Wruck**, Mabuigilgal/Goemulgal First Nations Postdoctoral Research Fellow, Department of Chemical Engineering, The University of Melbourne.

Indigenous knowledge must be a standalone priority and interwoven into the other priorities

Science & Technology Australia and a vast array of senior Indigenous stakeholders in our governance, membership and network were deeply disappointed that elevating and investing in Indigenous perspectives in STEM did not appear as a standalone priority in the draft priorities.

STA thanks the Department and Chief Scientist for their responsiveness and engagement to understand the importance of including both a standalone and interwoven approach on Indigenous knowledges in the proposed final priorities.

When the Minister announced the development of the priorities, there was great excitement in STA's Indigenous network that one of the Terms of Reference was:

Elevating and investing in First Nations perspectives on science, technology and innovation.



The draft priorities do not reflect this exciting ambition. That must be rectified in the final priorities.

Elevating and investing in Indigenous perspectives on science, technology and innovation should be a standalone priority for Australia, as should weaving Indigenous knowledge throughout the rest of our official national science and research priorities.

“Indigenous knowledge in Australia is important in its own right. It is the bedrock on which our country’s knowledge is built. It is what makes Australia – and our science and research endeavours – unique. Indigenous knowledge should not be seen just as an enabler of other objectives in Australian science and research.”

In addition to interweaving Indigenous knowledge through all the other priorities, a standalone priority to elevate and invest in Indigenous knowledge would strongly signal to the research community and the nation that this is core work for Australia – and central to our national science, technology and research ambitions.

“It would also be a powerful signal to Australia’s research funding agencies to invest in Indigenous people and perspectives in research, science, technology and innovation.”

This crucial signal can help to unleash a transformative moment for Australian STEM – and start a deeper investment in supporting more Indigenous people and priorities into our national science and research effort. It would be a powerful legacy for all the generations of Australians to come.

Proposed new Priority 1: Elevate and invest in Indigenous perspectives on science, technology and innovation

Objectives

Australia is home to the oldest continuous living cultures on the planet. This inspiring fact is unique – and key to Australia’s national identity. This inheritance lives in the deep knowledge of the continent held by Aboriginal and Torres Strait Islander people and communities. It includes vast scientific, technological, maths and engineering knowledge embedded in Aboriginal and Torres Strait Islander languages and cultures and the deep knowledge systems of the Country. Indigenous STEM knowledge is the long and impressive first chapter of Australia’s contemporary STEM knowledge base.

Our objectives:

- Elevate and invest in Indigenous knowledge and Aboriginal and Torres Strait Islander researchers.
- Inspire a culturally confident nation from our unique shared national identity.
- Support Indigenous researchers and Indigenous organisations to extend capacity and scale.
- Show Aboriginal and Torres Strait Islander people a future in STEM and research.
- Develop the cultural capability of non-Indigenous Australians to engage more effectively with Indigenous people, communities and knowledge.

A commitment to advance Indigenous people in and through STEM must be backed with concrete commitments to capacity building. Infrastructure such as reliable internet connectivity is needed to enable regional and remote communities to participate in STEM research, knowledge exchange and education. Employment and promotion of Aboriginal and Torres Strait Islander people in STEM roles in universities and elsewhere must be premised on cultural safety and support to prevent burnout.

Policy, initiatives and funding to advance Aboriginal and Torres Strait Islander researchers should actively work to support Indigenous researchers in all fields – both in fields that are closely connected to Indigenous knowledges, communities and issues; and Indigenous researchers working in wider fields and topics. Advancing Aboriginal and Torres Strait Islander researchers across all fields is vital to strengthening the Indigenous academy across Australia.



Funding to support Indigenous researchers must effectively support basic and applied research by Aboriginal and Torres Strait Islander researchers in all fields. More needs to be done to support Indigenous scientists and engineers to apply for funding. And more work is needed to strengthen the pipeline for Aboriginal and Torres Strait Islander people into the academic/research workforce.

Aims

- Australia acknowledges the nation's deep history and the knowledge systems embedded in Indigenous culture.
- Australia's research will be co-designed and delivered in genuine and equal partnerships with Aboriginal and Torres Strait Islander researchers and communities.
- Indigenous knowledge will inform Australia's environmental stewardship.
- Indigenous knowledge and culture will strengthen Australia's research.
- Australia's research, and strong partnerships with Aboriginal and Torres Strait Islander people, communities and knowledge, will inform policy to improve the lives of Aboriginal and Torres Strait Islander people and Close the Gap.
- Research institutions and funding agencies will advance Aboriginal and Torres Strait Islander researchers.

Critical research

- Research on the most effective policies and approaches to strengthen the pipeline of Aboriginal and Torres Strait Islander people into STEM education, and STEM research and careers. (*Inspire a culturally confident nation; Elevate and invest in Indigenous knowledge and Aboriginal and Torres Strait Islander researchers; Show Aboriginal and Torres Strait Islander people a future in STEM and research; Close the Gap*)
- Language preservation and promotion of bilingual education (*Inspire a culturally confident nation; Elevate and invest in Indigenous knowledge and Aboriginal and Torres Strait Islander researchers; Show Aboriginal and Torres Strait Islander people a future in STEM and research; Close the Gap*)
- Landscape management and environmental stewardship, including fire regimes, water security, management and stewardship and sustainable management of marine environments (*Elevate and invest in Indigenous knowledge and Aboriginal and Torres Strait Islander researchers*)
- Physical and cultural elements of individual and community health (*Elevate and invest in Indigenous knowledge and Aboriginal and Torres Strait Islander researchers; Inspire a culturally confident nation; Close the Gap*)
- Traditional/bush medicine (*Elevate and invest in Indigenous knowledge and Aboriginal and Torres Strait Islander researchers; Support healthy communities*)
- Aboriginal and Torres Strait Islander people should be an integral part of the development of emerging technologies such as AI and Quantum Computing (*Elevate and invest in Indigenous knowledge and Aboriginal and Torres Strait Islander researchers; Show Aboriginal and Torres Strait Islander people a future in STEM and research*).

Elevating Indigenous knowledge and ensuring co-design and collaboration throughout the National Science and Research Priorities will have significant influence and will support other policies to build broader system capability to support nurture Indigenous STEM including:

- **Show Aboriginal and Torres Strait Islander youth a future in STEM:** invest in pre-service and in-service teacher professional training that connects the teaching and learning of STEM with First Nations knowledges.



- **Invest in Aboriginal and Torres Strait Islander people to become STEM teachers.**
- **Ensure bilingual education in Aboriginal and Torres Strait Islander languages** is an integral part of the Australian education system and ensure national education initiatives like NAPLAN can cater for students in this type of education.
- **Develop clear educational pathways for all Aboriginal and Torres Strait Islander students to go to university** regardless of where they come from i.e. rural, remote and urban, with population parity as the goal.
- **Invest in the development of a National Indigenous STEM Network** for First Nations people who are working or being educated in STEM.
- **Require universities to develop deeper relationships with Indigenous communities** to develop programs in Indigenous-led, community-driven research where the benefits of research flow back to community.
- **Create dedicated funding streams:** The ARC and NHMRC should create funding streams to forge meaningful relationships with First Nations communities, promote Indigenous-led and community-driven research, protect Indigenous intellectual property and develop potential business/employment opportunities on Country to strengthen Country.
- **Create Indigenous STEM careers:** that support the values of First Nations Communities and work towards a sustainable future for all Australians. Develop clearer pathways into the academic/research workforce for Aboriginal and Torres Strait Islander STEM professionals.

While the draft priorities state that Indigenous knowledge will be reflected throughout, the power of **also** making Indigenous knowledge a stand-alone priority is compelling. Enshrining both a standalone priority **and** interwoven knowledge are crucial. This approach will elevate recognition of Indigenous knowledge and its importance to Australia. And it can pave the way for deep engagement and collaboration with Aboriginal and Torres Strait Islander scientists, researchers and communities. Such recognition can be transformative across the STEM and broader research sectors. It will enable investments in both Indigenous people and knowledge in STEM, as well as more effectively supporting the weaving of Indigenous knowledge through the broader priorities. To make Indigenous knowledge a standalone priority **and** to thread it through all of the other priorities would be powerful – and we strongly advocate this is done in the final priorities.

Science & Technology Australia acknowledges the perspective that having a standalone priority to elevate Indigenous knowledge runs a risk of Indigenous knowledge being seen as ‘separate’ and adding to the workloads of time-poor Aboriginal and Torres Strait Islander research leaders. However, it is the clear and confident view of a wide array of senior Indigenous stakeholders in the science and research sectors in the STA community that failing to elevate Indigenous knowledge in its own right as a priority means work would fall to Indigenous researchers – without resourcing.

Without a standalone priority that clearly makes it a priority to *elevate and invest in* Indigenous knowledge, Australia risks a piecemeal, ad hoc approach. The final priorities must include both: a standalone Indigenous knowledge priority, complemented with Indigenous knowledge and perspectives interwoven through the Aims, Objectives and Critical Research Areas of each of the other priorities.

Indigenous knowledge throughout the priorities

There are several areas where the weaving of Indigenous knowledge through each of the draft priorities could be improved and done more authentically.

Priority 1 – Ensuring a net zero future and protecting Australia’s biodiversity

Stronger language is needed than ‘We will work alongside Aboriginal and Torres Strait Islander peoples...’ This implies separate work programs, or that work done with Aboriginal and Torres Strait Islander people and communities will be on the terms of the non-Indigenous STEM community, with Aboriginal and Torres Strait Islander people ‘helping’. Authentic engagement must be driven through



stronger language that speaks to true and authentic engagement: with language such as partnership, ‘co-design’ and an approach to ‘value Indigenous knowledge’.

Indeed, given the fact that Aboriginal and Torres Strait Islander people have lived on this continent through tens of thousands of years – through past cycles of climate variation – Indigenous knowledge of resilience and adaptation should be more strongly recognised in the Aims and Critical research areas for this priority.

Priority 2 – Supporting healthy and thriving communities

This draft priority notes that ‘Australians recognise that Indigenous concepts of holistic health and wellbeing – the connections between healthy Country and healthy communities – can deliver benefits to all Australians’.

This draft language is not written in a way that will drive genuine engagement with Aboriginal and Torres Strait Islander researchers or communities. Given the importance of Aboriginal and Torres Strait Islander peoples’ data sovereignty, the extent of work needed to close the gap on health for Aboriginal and Torres Strait Islander people, and the complexities of the concepts involved with the ‘connections between healthy Country and healthy communities, co-design and deep partnerships must be forged to truly progress this priority and to support meaningful inclusion of Indigenous knowledge and Aboriginal and Torres Strait Islander people.

Priority 3 – Enabling a productive and innovative economy

Again, this priority should speak of partnership and co-design with Aboriginal and Torres Strait Islander people and researchers to develop business opportunities and protect Indigenous intellectual property. This extends beyond developing IP or new technologies with and for Indigenous communities. Any development or deployment of future green energy technologies such as wind or solar infrastructure that requires land must be based on genuine engagement and co-design to ensure appropriate use of Country and a fair deal for Traditional Owners.

Priority 4 – Building a stronger, more resilient nation

This priority speaks to building cohesion in an informed, resilient and democratic society. The only way to progress Australia’s future is to genuinely acknowledge the past through authentic truth-telling and honour the deep history of Aboriginal and Torres Strait Islander people. Aboriginal and Torres Strait Islander researchers and scientists simply must be involved in co-designing the research that will explore the cognitive and social influences on building a truly resilient Australian identity for this research to be effective.

Discovery research as a priority – build new knowledge to drive innovation

Discovery research generates new knowledge that underpins all innovation and development. Research that investigates the fundamental properties of our universe, ourselves and our environment ultimately drives the big breakthroughs that will lead to future impact and innovation.

Pursuing breakthroughs that can change the world – and give Australia a leading-edge advantage – is fundamental to our national wealth. Our investments in fundamental discovery research are crucial to Australia’s economic success.

Objectives

- Discovery research



Aims

- Australia will do world-class discovery research across fields of research. Discovery research will drive and inform R&D and innovation across the economy.

Critical research

- Discovery research across a variety of fields is important to maintaining Australia's international research competitiveness. A broad range of research in different fields increases the likelihood of world-changing innovation, including through interdisciplinary research.
- Discovery research is essential to effective efforts meet each of the other priorities.

Comments on specific priorities

Priority 1: Ensuring a net zero future and protecting Australia's biodiversity

This is a critical priority and integral to Australia's future.

A key component to meeting this priority is to include its socio-ecological elements. The environmental and technical aspects of this priority cannot be separated from the human elements – understanding how humans interact with environment and what drives human behaviour and societal change will be essential.

Also missing is a strong focus on water security. The Aims note that 'Australia will protect and restore marine, freshwater and terrestrial habitats'. 'Sustainable use of freshwater and ocean resources...' is included in the critical research areas but research into Australia's unique rainfall patterns, hydrology and hydrogeology should also be explicitly included. This work is essential to ensure Australia's future water needs – for the environment, human consumption and industry needs – can be met.

Proposed additions to Priority 1:

Aims

- Australia will develop research-informed policy and regulatory settings that enable change across the whole of society to support climate change mitigation and net zero. (*Support our pathway to net-zero; Understand and maintain our environment; Protect and restore biodiversity*)

Critical research

- Human-environment interactions and design of social and technological systems that can constrain climate change and biodiversity loss.
- Australia's hydrological regimes, including rainfall and climate patterns, surface water and hydrogeology to ensure water security for ecosystems, agriculture and human use.

Priority 2: Supporting healthy and thriving communities

Making Australia the healthiest country on Earth is another critical priority, and the focus on preventative health and equitable access to healthcare is strongly supported by Science & Technology Australia.

While Science & Technology Australia supports the Aims listed in this priority, they are driven just as strongly by policy as they are by research. Care must be taken to ensure a focus on the research that will enable the nation to meet these aims, and to recognise the role of government policy in realising them.



Missing from this priority is an inspiring objective/aim to push the boundaries of medical research with frontier work in key areas such as genomics, antimicrobial resistance, emerging cell therapies, vaccine development and med-tech applications and the diagnostic opportunities presented by AI.

While the focus on brain health is integral to this priority, the areas of critical research fail to include several other areas of important medical research that contribute to significant disease burden in Australia – such as cancer, cardiovascular disease, and chronic pain to include just a few.

Proposed additions to Priority 2:

Aims

- Australia will lead frontier research on the most pressing and urgent medical research challenges facing humanity. (*Lead on preventative health; Support healthy communities*)

Critical research

- Work to improve understanding of cancer and other leading causes of disease and improve treatments.
- Genomics and the development of personalised medicine.
- Exploring the opportunities presented by AI and machine learning in diagnosis, drug discovery and treatment
- Work to combat antimicrobial resistance and develop new antibiotics.
- Work to understand viral transmission, evolution and proliferation and develop new vaccines.

Priority 3: Enabling a productive and innovative economy

This priority must speak to the opportunity Australia has to develop a knowledge-driven economy – enabling Australia to progress beyond reliance on exploiting our mineral resources for national wealth to build a truly innovative and internationally competitive economy. The foundation of such a knowledge-driven economy is knowledge itself – generated through strong discovery research across a range of fields.

Pursuing breakthroughs that can change the world – and give Australia a leading-edge advantage – is fundamental to our national wealth. Our investments in fundamental discovery research are crucial to Australia's economic success.

Also missing from this priority is acknowledgment that Australia's agricultural sector is essential to the nation's wellbeing and the economy. This priority should acknowledge the need to advance research to enhance Australia's food and water security, as well as progressing ag-tech developments.

Similarly, Australia's space and astronomy research have significant potential to drive economic benefit through tech development and transfer, which merits clearer acknowledgement here.

Proposed additions to Priority 3:

Objectives

- Build a knowledge-driven economy fuelled by discovery research

Aims

- Australia will lead discovery research across critical areas of STEM and HASS

Critical research

- Discovery research across the STEM and HASS sectors, including inter- and trans-disciplinary research



- Astronomy and space research to understand the universe, our space environment and our planet and to build the space industry
- Development of critical technologies in communications, positioning and sensing

Priority 4: Building a stronger, more resilient nation

This priority must speak to building resilience in Australia's supply chains and sovereign manufacturing capability, acknowledging that building research capacity will promote business activity and build Australia's economic and social resilience.

Proposed additions to Priority 4:

Aims

- Australia will develop sovereign capability in critical medical and other areas to protect against global shocks.

Critical research

- Med-tech and ag-tech supply chain capabilities and research that will underpin sovereign capabilities in advanced manufacturing across critical areas.

Comments on language and messaging

The priorities need to be sharp directives to truly drive ambition and inspire the nation – even the linguistic structure is important. The current wording using present participle verb forms (-ing) does not telegraph a strong imperative. Compare:

Enabling a productive and innovative economy

with

Enable a productive and innovative economy

or with a stronger verb e.g.

Drive a productive and innovative economy.

Similarly, the wording of Priority 4 – *Building a stronger, more resilient nation* is not inspiring – it implies that incremental improvement would be sufficient (and perhaps that the aim will realise itself). Again, dropping -ing from the verb and the comparative form of the adjective (-er) would make for a much stronger construction:

Priority 4: Build a strong and resilient nation.

Deleting the verb altogether from each priority title would be an even stronger construction:

Priority 1: A net-zero future with strong biodiversity

Priority 2: Healthy and thriving communities

Priority 3: A productive and innovative economy

Priority 4: A strong, resilient nation

