

A budget for a technology powered, human driven future



The Australian Academy of Technology and Engineering (ATSE) is a Learned Academy of around 900 independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology, and engineering, ATSE provides impartial, practical, and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

ATSE welcomes the opportunity to provide a submission to the 2022-23 Federal Budget. This submission outlines the need to develop a skilled workforce for the future, create the conditions for research activity and commercialisation, and utilise technology to address climate change. To achieve this vision, we present a set of specific recommendations for strategic and targeted Government investment in the 2022-23 Federal Budget.

In the coming decade, Australia faces a unique set of challenges associated with decarbonisation of our economy, managing the decline of some industries, and training the workforce needed by new industries. To meet our economic, environmental, and industrial ambitions, ATSE recommends the development of a focused plan to create a technology powered, human driven future which must be:



In a technology powered, human driven future, high-growth industries on the cutting edge of technology will power economic growth and productivity.

This growth will be driven by inclusive and equitable policies to further develop our highly skilled and diverse workforce. This strategy will be crucial to tackle the challenges of the future, including climate change. There is now clear scientific evidence of an urgent need to create a sustainable, inclusive, innovative, and climate-resilient future.

For the 2022-23 Federal Budget, ATSE recommends prioritising three key areas: cultivating a skilled STEM workforce; creating conditions for increased research collaboration, translation, and commercialisation; and applying a technology-based approach to managing and mitigating climate change.

Developing a skilled STEM workforce

Emerging national challenges and opportunities will require a highly trained workforce equipped with STEM skills. Some of the fastest-growing professions are expected to be in advanced digital fields where the application of emerging technology will be critical. Without intervention, there will be a shortage of engineers to meet the challenges of tomorrow, with a predicted shortfall of 40,000 engineers (excluding software engineers) by 2025, and 100,000 engineers by 2030. There is an opportunity to produce more STEM-skilled graduates to meet this demand without relying on immigration, and to support workers in high-emitting industries to transition into a decarbonised economy.

To maximise the potential to develop Australia's modern and future workforce, interventions should be at all levels of learning, including developing interest in STEM among all school students, increasing STEM subject participation rates among senior secondary school students, and improving the retention of talented STEM university students and early-career STEM professionals. This must be underpinned by capable STEM school teachers who can instil a curiosity and understanding of STEM from the earliest levels. ATSE considers that this can be best implemented by requiring STEM teachers to qualify with a STEM Bachelor's degree followed by a one-year teaching diploma.



The following areas are targeted by the flagship ATSE programs:

CS in Schools builds capability in and enthusiasm for digital technology skills by supporting the delivery of coding classes in schools, aligned with and extending beyond the national curriculum.

STELR encourages uptake of STEM subjects through curriculum-aligned education modules using real-world applications and hands-on learning to pique students' interest in STEM concepts.

The **Industry Mentoring Network in STEM** initiative (IMNIS) develops Australian's future STEM leaders by connecting STEM PhD students and postdoctoral fellows to senior industry leaders for a structured year-long mentoring and professional development program, then offering them paid internships in STEM-relevant companies.

These proven programs demonstrate the feasibility of targeted interventions to strengthen the future STEM workforce.



ATSE recommends sustainable investment across all levels of education to expand the pipeline of a STEM-literate and skilled workforce, with the following as priority areas for the Australian Government:

RECOMMENDATION 1

Provide nation-wide access to programs (like CS in schools) for school students to develop digital literacy.

RECOMMENDATION 2

Provide nation-wide access to hands-on programs (like STELR) which develop practical science and engineering skills and inspire students into STEM-powered career paths.

RECOMMENDATION 3

Invest in developing the STEM teaching workforce, first of all by mandating that STEM teachers must either have a STEM specific degree or (for existing teachers) by upskilling and growing the confidence of “out-of-field” science and mathematics teachers, and secondly by providing incentives for science and mathematics teachers such as additional remuneration, scholarships and fee waivers particularly for regional, rural, and remotes schools.

RECOMMENDATION 4

Increase industry engagement and cross-sector research and development collaborations by resourcing industry internship and mentoring programs for early-career researchers.



Enhancing research collaboration, translation, and commercialisation

Research and development is the spearhead of economic growth in a modern industrial nation. Knowledge creation and application enables us to not only solve problems of the present but also be technology-ready for the challenges of the future. Strategic investments in research and development (R&D), as part of a broader national research investment framework, are required to address the major challenges and foster enhanced collaboration between industry and university-based research. To ensure research translation and commercialisation, the Government should prioritise readily applicable and genuine R&D.

Investment in research funding should be transparent, have measurable milestones and deliverables, and incorporate international benchmarking on technology research, development, and adoption. It should also encapsulate the entire research pipeline from curiosity-driven research to the commercialisation and uptake of the new technology. Strategic and targeted investments will result in the early adoption of future technologies and creation of critical national capabilities and promote resilient sustainable future growth.

ATSE also suggests a Digital by Default approach for major projects, as advocated by the 2021 Australian Infrastructure Plan, with data and digital valued alongside physical infrastructure. This will prioritise investment to targeted and scalable digital solutions and create a consistent approach in definitions and processes to support interoperability.

ATSE recommends targeted government investment in research and its translation and application, with the following priority areas:

RECOMMENDATION 5

Deliver a research funding strategy which covers the entire research pipeline from curiosity-driven research to industry-led research commercialisation.

RECOMMENDATION 6

Commit to fully fund the upcoming University research Commercialisation Scheme in full for no less than a five year period.

RECOMMENDATION 7

Create and invest in a national strategy to create a circular economy, including through modern manufacturing, data management and regulatory frameworks to accelerate a paradigm shift towards design for reduced waste and better product stewardship.

RECOMMENDATION 8

Use public procurement to create strong and immediate viable markets for new and environmentally sustainable domestic products.

RECOMMENDATION 9

Support a Digital by Default approach for major projects, as advocated by the 2021 Australian Infrastructure Plan, with data and digital valued alongside physical infrastructure.



Deploying technologies for climate change mitigation and resilience

Urgent action must be taken to mitigate the effects of climate change and achieve the net zero future that Australia has committed to. This requires ongoing investment in infrastructure, and R&D to fast-track the development and application of new and emerging technologies as required in Australia's Long Term Emissions Reduction Plan. In the short-term, immediate reductions to carbon emissions in high-emitting sectors can be made by supporting the deployment of and supporting infrastructure for existing technologies such as electric vehicles.

As immediate mitigation actions for the climate crisis, ATSE recommends the following for urgent implementation:

RECOMMENDATION 10

Invest in electric and hydrogen vehicle infrastructure including a comprehensive electric vehicle charging and hydrogen refuelling plan.

RECOMMENDATION 11

Increase public investment in developing emerging technologies as outlined in the Low-Emissions Technology Statements, within a publicly accountable implementation framework.

