

2023 consultation – Australia’s Science and Research Priorities: conversation starter

Consultation response from the Institution of Chemical Engineers (IChemE)

The Institution of Chemical Engineers (IChemE) is pleased to make this submission on Australia’s Science and Research Priorities: conversation starter consultation. IChemE has responded to the three conversation starter questions. The responses below will also help with addressing the current and future environmental challenges as outlined in the Government’s 2021 Intergenerational Report - Australia over the next 40 years [1]

Question 1. What are Australia’s greatest: a. challenges that science could help to address? b. opportunities we should seize? c. strengths we should maintain or build?

a. challenges that science could help to address?

Australia faces some great challenges including climate change (and the associated resilience and carbon management challenges). Australia also faces challenges in meeting the water, food and energy needs of its growing population, particularly water resource management and the provision of sustainable energy sources. Chemical engineers will play a significant role in making Australia’s food production and water systems more sustainably by reducing its consumption of energy and natural resources. Australia can capitalise on its world-class education system to train, develop, and upskill the next generation of science and engineering professionals.

To manage these challenges, Australia will need to focus on quantifying, controlling and reducing emissions. Further, it will need to focus on mitigating the effects or improving the overall resilience of the built and natural environment. An example of how this might be achieved is the UK government’s National Digital Twin program, which uses a Climate Resilience Demonstrator to show how connected data can improve climate adaptation and resilience across a system of systems [4]. There have also been good experiences with quantifying the amount of carbon embedded in infrastructure and processes to drive value engineering and demonstrate the benefits for reducing Scope 3 emissions by showing that cutting carbon cuts cost [5].

Projects such as Tuas Nexus (a co-located solid waste and recycled water plant) [6] in Singapore provide examples for addressing the food-water-energy nexus.

b. opportunities we should seize?

Australia has immense opportunities to produce and export energy and capitalise on the demand for clean energy vectors such as hydrogen [2]. Australia also has a wealth of critical minerals resources and there are huge opportunities along the value chain in the mining industry, to ensure the industry operates as sustainably, efficient and safe as possible. Exploiting these will require investment in developing skills in chemical engineering and related professions, and seizing opportunities from immigration pathways. IChemE with its strong member base in Australia can provide high quality professional training to chemical and process engineers working in these industries, including through the IChemE Safety Centre (ISC) which offers an extensive training programme and improves safety standards throughout the industry [3].

c. strengths we should maintain or build?

Australia has a wealth of natural resources, a world class education system and a highly skilled workforce, which constitutes its biggest strengths. Other areas of strength in Australia include a world class bio-medical research capability for the healthcare sector and significant opportunities for renewable energy generation.

Question 2. Does Australia have the capability and capacity needed to address these challenges, opportunities and strengths? If not, how could we build this?

Australia has strong capability and capacity to address the challenges, opportunities and strengths as outlined in question 1 above, using science and research. Australia needs to align to global best practice, attract the best talent through effective policy implementation, and develop this capability leveraging off its strong education system.

The key opportunities/enablers to deliver the above can be broadly classified into three main points:

- **Measurement of effectiveness of academic research** – Changing the KPIs for academic research from papers written and cited to outcome-based (level of collaboration, investment and product development). This would assist in transferring research to sustainable benefits.
- **Procurement and contracts** – The current contractual approach in Australia reduces collaboration and discourages bringing forward innovation. An alliance approach can have better results, for example the use of the New Engineering Contract in the UK water industry has resulted in significant savings and improved efficiencies between 30 – 50% over the last ten years, whereas in Victoria, Australia Water Bills have increased by around 70%. This is highlighted as a key requirement within the Infrastructure Australia 2022 Digital Roadmap [7].
- **Digital enablers** – These are linked to the above (Digital Twins, more effective use of Building Information Modelling through the delivery chain) and outlined in the Infrastructure Australia 2022 Digital Roadmap [7].

To build on Australia’s strengths and create investment / revenue streams from the science and research works, we would recommend:

- Building on our educational sector strengths to create efficiencies by:
 - Steering away from sunk costs where research and investment is not meeting the KPIs nor creating tangible outcomes (note also IChemE’s response to the Australian Productivity Commission report [8]).
 - Supporting innovative Research and Development (R&D), for example the LITSoN project, through the UK Water Partnership [9].
- Encouraging our researchers and highly skilled workforce to:
 - Develop, integrate, and implement globally recognised innovative technologies and best practice (i.e. not all innovation is new, it may just be new to Australia).
 - Encourage tech-ready to commercial products and incentivise collaboration of researchers with industry to create innovative products and solutions.
- Encouraging our policy makers to:
 - Develop effective policies to support innovative research and development through recognising innovation risks and project failure.
 - Take a long-term view to supporting start-ups.
 - Ensure that Australian Intellectual property is protected.

Question 3. Are the principles the right principles to shape the priorities?

IChemE’s feedback on the principles outlined within the discussion document is as follows:

- The principles are generally appropriate and outline objectives will create and open further discussion points.
- Some principles may benefit from minor changes or additions.
 - Principle 3 – Be evidence based – we would suggest adding wording around including searching for global best practice.
 - Principle 6 – Be bounded – we would suggest KPIs to ensure against defending sunk costs and managing efficiencies across the science and research investment.

The Institution of Chemical Engineers (IChemE)

The Institution of Chemical Engineers (IChemE) is a professional association with 30,000 members. IChemE is a not-for-profit, member-led qualifying body and learned society that advances chemical engineering's contribution worldwide for the benefit of society. We support the development of chemical, biochemical and process engineering professionals and provide connections to a powerful network of over 30,000 members in more than 100 countries. The Institution of Chemical Engineers in Australia has a board and staff in Australia.

This response has been produced by IChemE members in Australia and draws on the Institution's position on climate change published in November 2020 [10]. In 2020-22, IChemE also produced sectoral plans to support climate change action in multiple industries and jurisdictions, including energy transition, clean energy, water, food and pharmaceuticals. IChemE has submitted a detailed formal submission [2] on the Low Emissions Technology Statement 2022 consultation: Department of Industry, Science, Energy and Resources, Australian Government.

We support our members in applying their expertise and experience to make an influential contribution to solving major global challenges, including achieving the UN Sustainable Development goals.

IChemE would welcome the opportunity to provide more detailed information if required.

References

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