



## Summary notes of ACDS webinar presented by Dr Cathy Foley

August 2022

On Friday August 5, 2022, Dr Cathy Foley AO PSM, Australia's Chief Scientist, delivered an address as part of the ACDS Extending the Research Culture of Australian University Science webinar series. Dr Foley delivered a wide-ranging presentation on her advice to the new federal government on STEM-related matters and initiatives from her office.

The National Science and Technology Council (NSTC) is the pre-eminent source of science and technology advice to government. The NSTC is chaired by the Prime Minister, with the Science Minister as Deputy Chair. The Chief Scientist serves as the Executive Officer to the NSTC. The NSTC has been recently refreshed and is now the conduit for rapid, evidence-based reports to government on key issues.

For example, the NSTC has reported on the skills needs in Australia's emerging space sector. Australia could create up to 20,000 new jobs over the next decade in this sector. However, of the 319 skills used in the space industry, all but one are experiencing some level of shortage. The NSTC report urges a tertiary education response, both in the university and VET sectors, to increase the number of graduates able to meet this skills shortage. Specifically, Dr Foley emphasised a need to prepare graduates with a wide range of generic but transferable STEM skills rather than space-specific skills (most specialist skills in the space industry are developed via on-the-job training).

The NSTC is currently preparing reports to government on:

- How to close the 15% gap in capability to reach net zero carbon dioxide emissions.
- The technological opportunities in critical minerals processing, and
- STEM career pathways and skills

Dr Foley also reported that she has established the Government Scientists Group (GSG), consisting of the chief scientists of various government departments and agencies. The GSG is working on ways to map and communicate the scientific capability of the public service.

Elaborating on the headline themes of NSTC focus, Dr Foley reported:

### **Emissions Reduction**

- Remains an on-going challenge for Australia's research and innovation community, and for the wider economy.
- Will require breakthrough science and new discoveries, with a clear plan by 2030 on how to reach net zero emissions (by 2050).
- Requires a shift of technologies from the lab to commercialisation at scale.

- Activity will involve a greater role for the Climate Change Authority, including with more science-based capability on the Authority's Board, to advise government on the complexity of this task.

### **Critical Technologies List**

- The Chief Scientist is working with the Critical Technologies Hub to oversee the list of critical technologies in the national interest. The Critical Technologies Hub has been structured with three cross-agency nodes – focussed on issues of science, economic and national security. The Chief Scientist is heading the Science Hub.
- Critical technologies are those that “drive economic growth, afford military advantage and bolster soft and hard power”. They are the technologies that are essential for our modern society. The task for critical technologies is to get the balance right between sovereign capability and global engagement. Dr Foley emphasised Australia's need to “protect but promote”.
- The list of critical technologies is a living document and will be regularly updated, with broad-based consultation, including from Australia's science community. The Hub is looking to ensure that Australia's capability gaps in biotechnology, artificial intelligence, robotics, and quantum computing are addressed. Further input and advice from the ACDS and its members is welcome and encouraged.

### **Semiconductor Supply Chains**

- As part of strengthening Australia's sovereign capabilities, the federal government has an ambition to play a larger role in the semiconductor supply chain. The potential is significant. The global market just for chips in the semiconductor industry today is worth more than US\$400 billion, and some estimates are that it could be worth \$1 trillion by 2030. If Australia can capture just one-20<sup>th</sup> of that, which is not unrealistic, that's worth \$50 billion to the national economy.
- But as a nation, we're coming from a low base. For instance, Taiwan has an estimated 50,000-strong workforce in integrated circuit design. The Chief Scientist reported that Australia graduates only about 50 people a year with an IC design skillset.
- Australia does have significant expertise in compound semiconductor fabrication, RF, millimetre wave and power electronics and in photonics - but it's fragmented, not linked up and not at the scale the nation needs.
- Tremendous value-add opportunities exist. For example, Australia provides the raw ores for many of the critical elements used semiconductors manufacturing. Two pieces of work are underway nationally to help realise these opportunities. The first is mapping deposits of the critical minerals (such as quartz, germanium, gallium, indium, and heavy rare earths), and shifting towards mid-stream processing. The second is to better coordinate activities around the country so that Australia can gain a larger slice of the global growth.
- The Chief Scientist is working to ensure that environmental and social governance (ESG) considerations are built into this work. ESG hasn't had sufficient focus historically and will be critical for the nation's economic advancement.

### **Quantum Technologies**

- The Chief Scientist is leading the development of a National Quantum Strategy. The Strategy will be released later in the year. The federal government is focused to ensure the nation

can maximise our significant expertise in quantum technologies, especially in the areas of sensing, computing, communications, and cybersecurity.

- Dr Foley is setting up a National Quantum Committee to help develop the Strategy. Committee membership will be strongly academic but will also include experts from industry and other spheres. The emerging technologies will require a strongly collaborative approach across STEM sectors for Australia to make the most of our investment and positioned as a global leader in the field.
- However, skills shortages are acute in this sector. International competition for home grown expertise and talent remains a significant challenge.

### **The STEM Workforce**

- Dr Foley reported on the insufficient number of domestic STEM graduates entering the workforce to meet Australia's growing technology needs. The nation is not preparing enough STEM graduates for the (domestic) jobs of the future.
- However, the challenge is more than a concern for the higher education sector. Dr Foley reported on the steady decline in Year 12 students choosing to study physics in New South Wales as a proxy for the contracting STEM talent pipeline into universities nationwide.

### **Research Metrics**

- The Chief Scientist remains concerned that the current research metrics are too narrowly focused on citations and publishing in the top tier journals. These metrics do not necessarily equate to quality. Dr Foley believes that there is a need to take a wider view; to consider factors such as mentorship, student engagement, career mobility, time spent in industry, collaboration, peer review, commercialisation, and multidisciplinary research.
- Dr Foley is scoping a project that will consider how to bring these kinds of activities into research metrics. She welcomes ideas and input from ACDS members.

### **Indigenous Knowledge and Science**

- Recognition and development of Indigenous science is a very high priority for the Government. The Government Scientists Group (GSG) has made Indigenous knowledge and science a priority, and the Group has recently discussed the matter. Presentations from the CSIRO, the Institute of Marine Science, and the Agriculture and Fisheries and Forestry Department have initiated these discussions. The GSG has agreed to establish a working group to take this further.
- Initial discussion has centred on Indigenous involvement in co-design, engagement, and delivery, as well as workforce and careers pathways, and recognising intellectual property. Dr Foley emphasised her view that this is broader than a diversity and inclusion issue; it is about recognition of methods and knowledge and ways of recording and working closely to bring that knowledge to benefit the wider community.
- A possible model for advancing Indigenous knowledge and science is the Trans-Tasman Strategic Alliance Agreement on Science and Innovation. Signed in July 2022 by non-government Indigenous representatives from Australia and New Zealand, the Alliance Agreement promotes cooperation on science and innovation between Indigenous communities.

## **Open Access**

- Dr Foley updated webinar attendees on progress in the development of an Open Access Strategy for Australia. This has the support of the Government and the Science Minister, who is keen to progress the initiative.
- Dr Foley has released a possible model to generate discussion and conducted a prospective analysis to gauge stakeholder views and to identify the questions to address when building the Strategy.
- Stakeholder feedback has been very positive, but there are things to iron out, including the funding and regulatory arrangements, and how to manage the transition. Dr Foley described the initiative as “disruptive but doable”.
- A business case is being developed which investigates the issues identified above and builds a productivity argument for embracing Open Access as a national priority. Outcomes of the business case will be released soon.

Following her presentation, a lively Q&A session with webinar participants followed. The ACDS thanks Professor Eileen McLaughlin for organising the ACDS Extending the Research Culture of Australian University Science webinar series.

Professor Mark Buntine,

**Secretary/Treasurer ACDS**