ACOLA

AUSTRALIAN COUNCIL OF LEARNED ACADEMIES

SECURING AUSTRALIA'S FUTURE

NOVEMBER 2012

Program Report #1

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SECURING AUSTRALIA'S FUTURE

A three-year research program, funded by the Australian Research Council and conducted by the Australian Council of Learned Academies for PMSEIC, through the Office of the Chief Scientist

PROGRAM REPORT NOVEMBER 2012

The Research Brief from the Prime Minister's Science, Engineering & Innovation Council

The Australian Government has identified the "opportunities and challenges of an economy in transition" as a key issue facing the nation. Maintaining the *status quo* is not an option. It is therefore critical for substantial consideration to be given as to how different sectors of our society and economy can be encouraged to be as adaptable as possible in times of national and global changes.

The challenges include: (i) changes, of varying degrees, to all aspects of what we might call the current Australian "niche"; and (ii) the global environment in which Australia will be required to compete.

To secure Australia's future, it is crucial to understand how best to stimulate and support creativity, innovation and adaptability, across industries and in our communities; to have an education system that values the pursuit of knowledge across all domains, including the benefits of science, technology, engineering and mathematics; and to be more willing to support change, through effective risk management. All of these elements are important in considering how to drive Australia's productivity and economic growth.

ACOLA will work to complement and inform the Prime Minister's Science, Engineering and Innovation Council (PMSEIC) in their role by undertaking in-depth, multidisciplinary research on a range of topics within the aim of *Securing Australia's Future*.

The Expert Working Groups

PMSEIC has identified six initial areas for research

- **Australia's comparative advantage**
  - Prof Glenn Withers FASSA (Chair)
  - Peter Laver FTSE (Deputy)
  - Prof Jo Lo Bianco FAHA
  - Prof Graham Farquhar FAA FRS

- **STEM: Country comparisons**
  - Prof Simon Marginson FASSA (Chair)
  - Prof Russell Tytler (Deputy)
  - Prof Nalini Joshi FAA
  - Prof Stephen Gaukroger FAHA
  - Prof Geoff Prince
  - Prof Sue Richardson FASSA
  - Mr David Hind FTSE

- **Asia literacy – language and beyond**
  - Prof Ien Ang FAHA (Chair)
  - Prof Chennupati Jagadish FAA FTSE (Deputy)
  - Prof Kent Anderson
  - Prof John Fitzgerald FAHA
  - Prof Fazal Rizvi FASSA
  - Prof Krishna Sen FAHA
  - Prof Mark Wainwright AM FTSE

- **The role of science, research and technology in lifting Australian productivity**
  - Dr John Bell FTSE (Chair)
  - Dr Bob Frater AO FAA FTSE (Deputy)
  - Leslie Butterfield
  - Prof Mark Dodgson FASSA
  - Prof Tom Spurling AM FTSE
  - Prof Stuart Cunningham FAHA
  - Prof Kevin Fox FASSA
  - Prof Elizabeth Webster

- **New technologies and their role in our security, cultural, democratic, social and economic systems**
  - Prof Rob Evans FAA FTSE (Chair)
  - Prof Bob Williamson FAA (Deputy)
  - Dr Genevieve Bell FAHA
  - Prof Gerard Goggin FAHA
  - Prof Rod Broadhurst FAHA
  - Prof John O'Callaghan FTSE
  - Prof John Mattick FAA
  - Prof Stephen King FASSA
  - Dr Michael Keating FASSA
  - Prof Ron Johnston FTSE

- **Engineering energy: unconventional gas production**
  - Prof Peter Cook CBE FTSE (Chair)
  - Dr Vaughan Beck FTSE (Deputy)
  - Prof Robert Clark FAA FRSN
  - Dr John Williams FAA FTSE
  - Prof David Bereton
  - Prof Sandra Kentish
  - John Toomey FTSE

The six initial projects

PROJECT #1

AUSTRALIA'S COMPARATIVE ADVANTAGE

This project will address issues including, but not limited to the following:

- What are the characteristics of Australia's environment, biodiversity, location, cultural composition and other distinctive contexts that define the niches in which we can prosper in the global environment?
- What makes us unique and/or attractive as partners in R&D, industry and innovation?
- What are the advantages we can build on that will assist us in positioning ourselves to enhance productivity, innovation, fairness and equity?

PROJECT #2

STEM: COUNTRY COMPARISONS

This project will address issues including, but not limited to the following:

- What are other countries doing to address declining STEM uptake and its impact on the workforce?
- Are measures put into effect in other countries and cultures successful, and how has this been evaluated?
- Could and should such measures be applied in the Australian context, taking into account our cultural diversity?
- What are the implications of the application of culturally appropriate measures in Australia, and will the policy framework need to be modified to accommodate them?

PROJECT #3 ASIA LITERACY – LANGUAGE AND BEYOND

This project will address issues including, but not limited to the following:

- What are the attributes (such as personal interactions, ways of learning, cultural sensitivities) needed to succeed in Asia?
- What skills and knowledge would make it easier for people to collaborate in science, research and business?
- How do we use science and cultural diplomacy to advance our broader interests in Asia Pacific?
- What examples stemming from science and cultural diplomacy can we learn from?
- How could we most successfully assist development in the Pacific region?

PROJECT #4 THE ROLE OF SCIENCE, RESEARCH AND TECHNOLOGY IN LIFTING AUSTRALIAN PRODUCTIVITY

This project will address issues including, but not limited to the following:

- What are the attributes of an innovative workforce?
    - How do we generate increased awareness and acceptance of the value of a science degree in business and in industry?
    - How do we build a broader science, research and technology base in the workforce?
- What are the future workforce needs of Australian industries?
- What are the future manufacturing issues we need to address?
- How can we maximise the translation of research and innovation into productivity?
- How can we more effectively collaborate internationally to improve Australia's global reach and international impact in science, research and technology?

PROJECT #5 NEW TECHNOLOGIES AND THEIR ROLE IN OUR SECURITY, CULTURAL, DEMOCRATIC, SOCIAL AND ECONOMIC SYSTEM

This project will address issues including, but not limited to the following:

- What do we know of new science and technology developments that are impacting us now?
- What are the likely impacts of new and emerging technologies on our biosecurity and cybersecurity arrangements and social and economic system?
- What is business and industry's level of literacy and uptake of new technology?
- How well are we placed to anticipate these developments and prepare for their impacts?
- What new opportunities exist in the application of social media and communication technologies for communities and government?
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PROJECT #6 ENGINEERING ENERGY: UNCONVENTIONAL GAS PRODUCTION

This project aims to explore the scientific, social, cultural, technological, environmental and economic issues surrounding alternative energy sources, with particular reference to unconventional gas production. The project will address the following issues:

- Resources
    - Australia is considered to have significant potential for major shale gas deposits; what is the likely size and location of those resources?
    - Is the appropriate technology available? Is the North American Exploration model for shale gas applicable to Australian conditions? Is there a need to develop new models?
- Technology
    - How amenable are shale gas resources likely to be to commercial production in Australia?
    - Are existing technologies appropriate or will there be a need to develop new technologies, such as new water or fracking technologies?
- Monitoring
    - How might fracking and other related sub surface processes be monitored to ensure best practice and how might best practice be measured?
    - What role might this play in informing public debate?
- Infrastructure
    - Will it be necessary to develop new infrastructure (pipelines, drilling capability etc.) to enable the exploitation of likely shale gas resources to proceed?
    - What will the 'value-add' be for Australia of these new infrastructure developments?
- Human and Environmental Impacts
    - What are the potential risks to the human and natural environment arising from shale gas production?

    - How might they be mitigated?
- Communication of issues
    - This project is likely to explore issues around and contribute to effective communication of the science, technology, and other issues surrounding shale gas production to the community
- A systems based approach
    - Is the current regulatory system in place in Australia adequate to ensure safe operations of the industry?
    - Will existing systems provide satisfactory multiple land use frameworks? Will they facilitate sensible management of a range of sub surface resources (groundwater, CSG, coal, geothermal, CO2 storage)?
- Coal Seam Gas: Lessons Learned
    - The production of coal seam gas in Australia has the potential to provide enormous financial benefit to the nation but is also resulting in community concerns and discord; what can we learn from the community problems arising from CSG in planning for future shale gas production?
- Impacts on the economy
    - If as predicted by some, global shale gas production and use undergoes a massive increase how will this impact on the Australian economy and Australia's energy and energy intensive exports?
    - How does shale compare to alternative technologies, including other unconventional gas sources such as CSG in terms of cost?
- Impacts on GHG reduction targets
    - What might be the impact of large-scale production and use (for example in electricity generation) of shale gas on Australia's greenhouse gas reduction targets?

Australia's four Learned Academies are the Academy of the Social Sciences in Australia, the Australian Academy of Science, the Australian Academy of the Humanities and the Australian Academy of Technological Sciences and Engineering. The Australian Council of Learned Academies (ACOLA) provides the forum for the four Learned Academies to work cooperatively to develop cutting-edge thinking and integrated problem solving.

SECURING AUSTRALIA'S FUTURE is governed for ACOLA by a Program Steering Committee comprising Fellows of the four Learned Academies

Dr Alan Finkel (Chair) AM FTSE
Prof Julianne Schultz (Deputy Chair) AM FAHA
Mr Dennis Trewin (Deputy Chair) AO FASSA
Prof Michael Barber FAA FTSE
Prof Ruth Fincher FASSA
Dr Margaret Hartley FTSE
Prof Iain McCalman AO FAHA FASSA FRHS
Dr Graham Mitchell AO FAA FTSE
Dr Jim Peacock AC FRS FAA FTSE
Dr Susan Pond AM FTSE
Prof John Quiggan FASSA
Prof Richard Waterhouse FAHA FASSA

Academy Fellows and other researchers interested in submitting written contributions to any of the six projects should contact the Secretariat for more information.

Early Career Researchers interested in participating in the program Securing Australia's Future, as project support staff, researchers, writers or occasional observers, should contact the Secretariat for further guidance.

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