

Strategic Policy Research for Advancing Biotechnology in Australia

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Unlocking the full potential of biotechnology for Australia's society, environment and economy will require targeted policy research

Key points

Biotechnology: Using living and non-living materials to create products and services will generate over 50,000 jobs and \$30 billion annually for Australia's economy by 2040.

Government Initiatives: To support this growth, the Queensland and Australian governments have established initiatives like the Queensland Biofutures 10-Year Roadmap and Action Plan and the National Synthetic Biology Roadmap, and funded research through programs like The Food and Beverage Accelerator and the ARC Centres of Excellence.

Research Agenda: To help create enabling policy conditions for innovation and market entry, a proposed 3-pronged research agenda aims to:

- *Analyse the regulatory policy landscape* to identify gaps and inconsistencies, and recommend reforms
- *Learn from international best practices* to inform Australian policy
- *Develop innovative policy and governance options* to maximise the benefits of biotechnology

The biotechnology revolution

Biotechnology involves using living and non-living materials to create new products and services. It encompasses a variety of technologies, such as synthetic biology, precision fermentation, and bioinformatics. Biotechnology finds its applications in numerous sectors including, but not limited to, biopharmaceuticals, food and beverages, bioenergy, and industrial chemicals.

As a rapidly evolving field, biotechnology is spearheading transformations across various industries. This includes reducing greenhouse gas emissions, enhancing food security, and pioneering sustainable energy sources. The impact of biotechnology is already evident in innovative solutions emerging in areas like sustainable food production, bio-based materials, and renewable energy. For example, biotechnology is being used to produce disease and pest-resistant crops, biofuels from algae and other biomass, and bioplastics from renewable resources.

Benefits and investments

Biotechnology has the potential to contribute significantly to the economy. In the context of synthetic biology, for example, it is poised to generate more than 50,000 new jobs across diverse sectors and could enhance Australia's economy by over \$30 billion per year by 2040.¹ The Queensland and Australian governments are supporting the biotechnology revolution through significant initiatives. The "Queensland Biofutures 10-Year Roadmap and Action Plan" is one such initiative that sets an ambitious goal for the expansion of Queensland's industrial biotechnology sector.² Another key initiative is the "National Synthetic Biology Roadmap", which



offers a strategic and commercially oriented perspective on how synthetic biology could support a prosperous Australian bioeconomy.³

Australia has also invested in research and translation initiatives to support the growth and commercialisation of biotechnology products.¹ These initiatives are pushing the technological boundaries in food, fibre, and energy production, and include the [Food and Beverage Accelerator](#), [ARC Centre of Excellence in Synthetic Biology](#), [ARC Centre of Excellence in Quantum Biotechnology](#) and CSIRO's [Advanced Engineering Biology Future Science Platform](#).

Why policy research matters

Unlocking the full potential of biotechnology for Australia's society, environment and economy will require concerted efforts to further create enabling policy conditions.

In general, biotechnology-related policy frameworks often struggle to keep pace with the rapid development of innovation. They are commonly based on the assumption of stable and predictable markets, which is not always suitable for fast-changing and radically novel technologies and innovative business models. Moreover, existing policies are usually sector-specific and fail to address the broad impacts and challenges posed by general-purpose technologies. They are mostly reactive rather than proactive, which can limit their ability to anticipate and prevent potential harm and/or facilitate positive outcomes. Finally, these frameworks are often rigid and prescriptive, rather than flexible and adaptive. This can hinder useful innovation that does not fit within existing rules or standards.⁴

In sum, the existing policy frameworks can hinder innovation and market entry, both domestically and internationally. It is crucial to reform these frameworks to better align with the characteristics of biotechnology. Such reform should be informed by strategic policy research that considers the needs and priorities of various stakeholders, including scientists, industry, government, non-government organisations, and consumers.

Research agenda

To address the challenges outlined above, we propose three broad research areas as a starting point:

1. Regulatory landscape

This research area focuses on understanding the existing regulatory policy frameworks for biotechnology applications. It includes mapping and analysing these frameworks to assess their support for innovation and market entry, identifying policy gaps and inconsistencies, and recommending options for reform to better enable biotechnology. By understanding and addressing regulatory challenges, this area aims to reduce the time and cost

of developing and deploying biotechnology products and increase the certainty and predictability of the regulatory environment for stakeholders.

2. International best practices

This research area aims to identify best practices in biotechnology-related regulatory policy and governance from other countries that could apply to the Australian context. It includes learning from both successful and unsuccessful examples to inform future policy reforms. This area can help guide the development of innovative regulatory frameworks for biotechnology (Area 3) and help avoid the mistakes made by other countries.

3. Policy and governance innovation

This research area focuses on developing innovative approaches to policy and governance to address regulatory challenges identified in Area 1, drawing on findings from Area 2 and frameworks, such as anticipatory regulation and adaptive governance. The goal is to propose options for policy reform that are flexible, proactive, future-facing, and risk-based, meeting the needs of scientists, industry, and government stakeholders. By promoting innovative approaches, this area aims to support the development of more effective and fit-for-purpose policies.

The proposed research agenda can be implemented through a collaborative approach involving industry, government, and research organisations. Engaging relevant stakeholders and rights holders (e.g., Traditional Owners) will ensure that the findings are inclusive and effectively support the biotechnology sector. Additionally, co-investment from both government and industry will be crucial to developing strategic policy research that supports establishing the necessary enabling conditions for biotechnology development.



¹ CSIRO and Main Sequence Ventures (2023) Synthetic Biology: National Progress Report. CSIRO, Canberra.

² State of Queensland (2016) Queensland Biofutures 10-Year Roadmap and Action Plan. Department of State Development, Manufacturing, Infrastructure and Planning, Brisbane.

³ CSIRO Futures (2021) A National Synthetic Biology Roadmap: Identifying commercial and economic opportunities for Australia. CSIRO, Canberra.

⁴ Hussey, K., Yarnold, J., McEwan, C., Maher, R., Henman, P., Radke, A., Curtis, C., Fidelman, P., Vickers, C. and Brolan, C. (2019) Policy Futures: Regulating the New Economy, Centre for Policy Futures, Issue 1.

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