



# Queensland Biomedical 10-Year Roadmap and Action Plan

June 2017

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# Foreword

The AU\$420 million Advance Queensland initiative is a key part of the Queensland Government's plan to diversify the economy and create the knowledge-based jobs of the future. It is a demonstration of our commitment to supporting high-growth, innovation-based sectors and building an entrepreneurial culture. The Queensland Government has identified the biomedical sector as one that will play an important role in helping achieve these objectives.

Queensland's biomedical sector is underpinned by excellence in science and operates within a global value chain. Investment by previous Queensland governments has been extremely successful in building world-leading research institutes and science capacity and capability in areas including immunology and vaccine development and delivery, biologics, precision medicine and infectious diseases.

According to Deloitte research, Queensland's biomedical industry has an estimated gross value-added (GVA) of approximately AU\$1.44 billion, employs about 9,440 people and is forecast to grow by up to 38 per cent over the next 10 years. Queensland is in a strong position to assume an important role in the global value chain, given our proximity to Asia, our well-educated workforce and our stable regulatory and political environment.

However, growing the biomedical sector will not be without its challenges.

The global economic landscape is changing at a rapid pace. Yet, with technological advances continually forcing the creation of new markets and increasing customer demands, Queensland has never been in a stronger position to cement its profile as an attractive investment destination and innovative biomedical hub.

The success of Queensland's biomedical industry will mean exploiting our key strengths and competitive advantages to become the preferred choice in specific stages of the value chain. These include an established, world-class research base and translational research facilities, an excellent education system, and a subtropical location in close proximity to the Asia-Pacific region.

The *Queensland Biomedical 10-Year Roadmap and Action Plan* identifies three key strategies with supporting action items to drive growth in this sector. These strategies articulate the Queensland Government's vision to diversify Queensland's industry base, create high-value, well-paid, knowledge-based jobs and drive export growth for the industry by 2027.



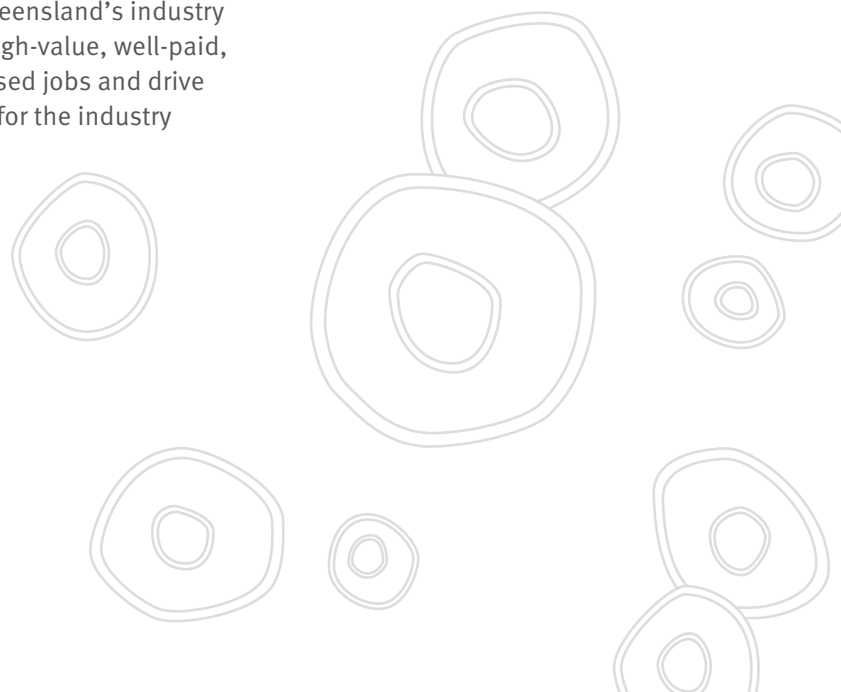
**The Honourable  
Anastacia Palaszczuk MP**

Premier of Queensland,  
Minister for the Arts



**The Honourable  
Dr Anthony Lynham MP**

Minister for State Development  
and Minister for Natural Resources  
and Mines





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# Vision

By 2027, Queensland will be a regionally integrated and globally competitive Asia-Pacific biomedical industry hub recognised for its excellence in biomedical innovation, highly skilled professional workforce, and world-leading translational biomedical research facilities.

The Queensland government recognises the economic contribution the emerging biomedical industry brings to Queensland and is strongly committed to supporting this knowledge-intensive industry to increase employment and business opportunities in our state.

Since 1998 Queensland governments have invested in the life sciences sector, which includes human and animal healthcare, agricultural biotechnology, environmental biotechnology, marine biotechnology and industrial biotechnology. While the initial focus was on building Queensland's research capacity, under Advance Queensland it has turned towards translation and commercialisation.

The *Queensland Biofutures 10-Year Roadmap and Action Plan* launched in June 2016 is capitalising on this investment in the life sciences sector to build a sustainable and export-oriented industrial biotechnology and bioproducts sector. The Department of Agriculture and Fisheries is developing a roadmap that will capitalise on this investment to support Queensland's crops and livestock biotechnology industries.

The Queensland biomedical roadmap focusses on human and animal healthcare, leveraging existing biomedical strengths and emerging capabilities, including:

- immunology and vaccine development and delivery
- biologics
- precision medicine
- infectious and tropical diseases
- immunotherapy
- genomics and data
- rapid response to emerging global biomedical threats
- convergence:
  - smart devices, implants and bionics
  - diagnostics and informatics.

The roadmap seeks to leverage benefits for Queensland available through Commonwealth initiatives. The Australian Government's Industry Growth Centre, MTPConnect, in its *Sector Competitiveness Plan* outlines a 10-year vision to maximise the Australian medical technologies, biotechnology and pharmaceutical sector's competitiveness and

productivity, and to achieve more rapid and sustained growth.

Queensland is also well placed to take advantage of the growth opportunities provided by the global megatrends identified in the *CSIRO Medical Technologies and Pharmaceuticals Roadmap* that are disrupting commercial, societal and cultural approaches to the development of the medical technology and pharmaceutical growth area. These include:

- managing chronic disease
- personalised healthcare
- global biosecurity
- consumer control
- digital evolution
- emerging markets
- integrated healthcare.

Based on these megatrends, CSIRO has identified four growth opportunities for Australia based on its competitive position: smart devices, implants and bionics; manufacturing high-value pharmaceuticals; accelerated pharmaceutical development; and diagnostics and informatics products and services.<sup>1</sup>

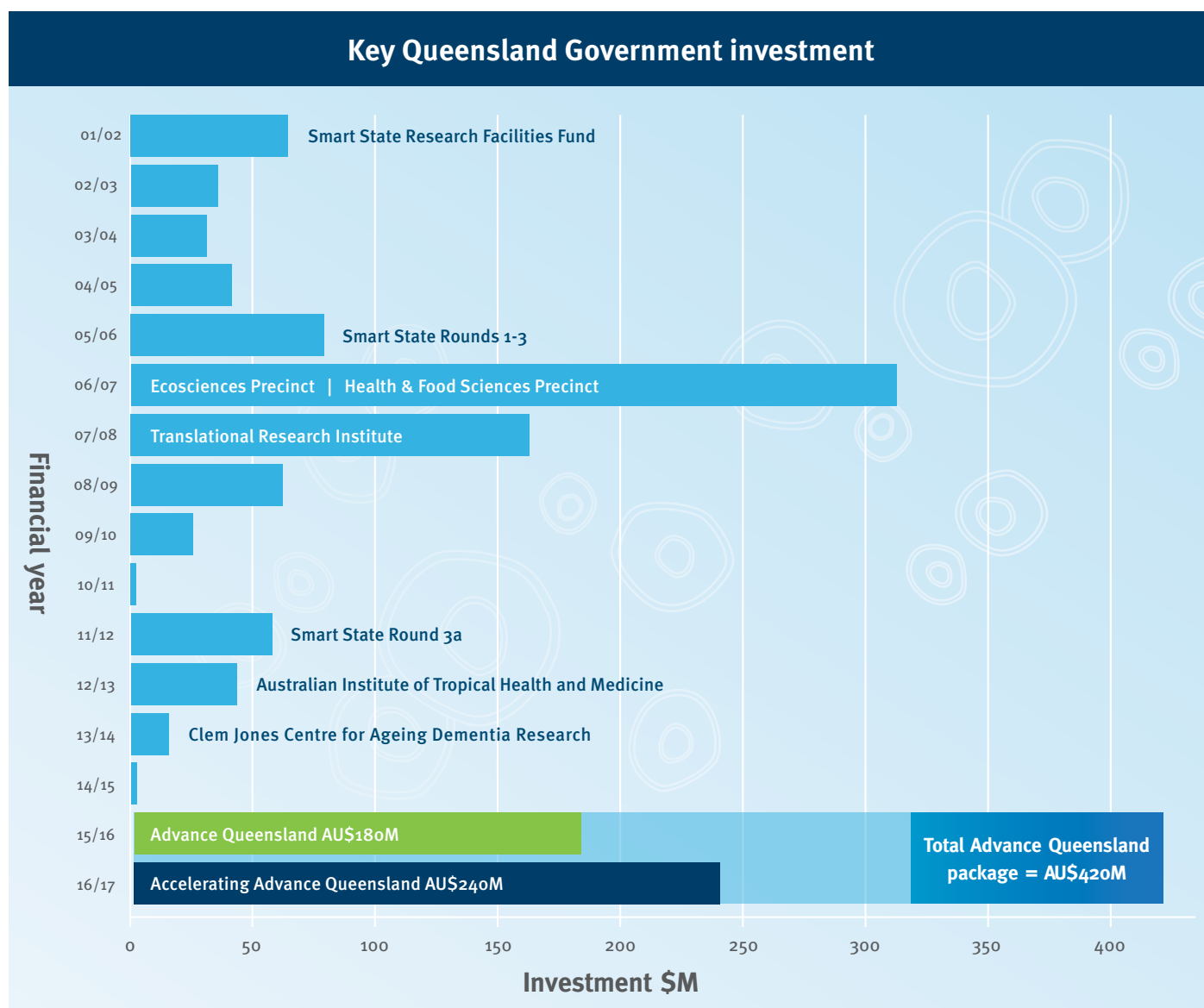
As a priority of the Advance Queensland initiative, this roadmap will demonstrate how Queensland can drive economic growth by taking advantage of these megatrends to grow the industry and position the state as an attractive investment destination.

Several key themes emerged during the consultative phase that highlighted industry and

academia's priorities for this growth sector. These included access to capital and commercial biomedical expertise, greater connectivity and collaboration, and the need to raise awareness of the sector's capabilities.

To achieve the Queensland Government's vision, this roadmap contains actions under three key strategies:

- supporting Queensland's start-ups to prosper and successfully scale-up
- supporting existing businesses to grow and attract new businesses to Queensland
- promoting capabilities to attract investment and facilitate alliances.



Source: Adapted from DSITIA (2013), Audit of Science Investment and Funding Programs.

The Queensland Government recognises the unique opportunity to take advantage of global biomedical megatrends and increase the state's export of high-value biomedical products, processes, technologies and services.



# Queensland industry snapshot

Queensland is home to a cluster of agile, innovative and entrepreneurial niche businesses focussed on biopharmaceuticals, generic pharmaceuticals, medical devices and niche point-of-care diagnostics. Queensland is also home to a handful of large, multinational biomedical manufacturing businesses.

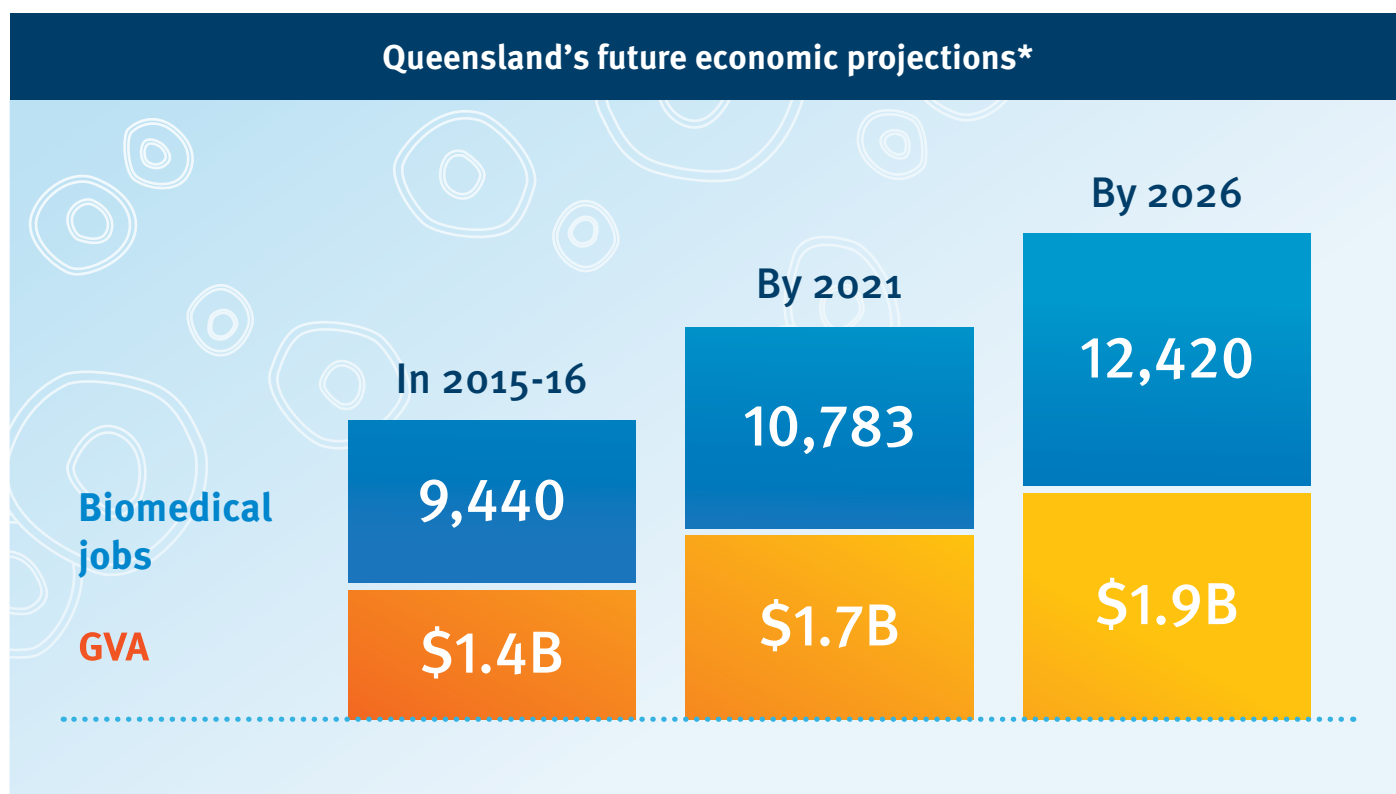
Queensland hosts a thriving complementary medicines industry that includes companies such as Integria Healthcare, Health World Limited and Sanofi Aventis Consumer Healthcare. Together these companies employ around 900 people in the state, adhere to the strictest standards (GMP manufacturing) and export high-quality products worldwide.

Queensland's biomedical industry also includes a range of support services including:

- health economics
- pre-clinical and early phase clinical trials
- regulatory affairs
- financial services, including research and development (R&D) tax services
- recruitment
- intellectual property and other legal services.

These support services are critical to the future growth of an industry that is highly regulated and science-driven.

According to Deloitte research, Queensland's biomedical industry currently has an estimated gross value added (GVA) of approximately AU\$1.44 billion and employs around 9,440 people. The industry is forecast to grow by up to 38 per cent over the next 10 years.



\* Deloitte research carried out for the Queensland Government.



Queensland has recognised the benefits of collaboration to achieve translation and commercialisation with existing and emerging clusters of industry at different stages of maturity. South East Queensland's health and knowledge precincts comprise clusters of industry and research institutes, including universities and state-of-the-art hospitals:

- **Herston Health Precinct:**  
An expanding world-leading health precinct to provide Queenslanders with access to state-of-the-art health, hospital and aged care services, as well as creating scope in the future for international-standard research and educational facilities. The precinct is based around the Royal Brisbane and Women's Hospital and the QIMR Berghofer Medical Research Institute.
- **The Translational Research Institute and the broader Princess Alexandra Health Precinct:**  
A leading centre for integrated

healthcare; translational health and medical research and commercialisation; and education. The precinct aims to achieve better health for the community and deliver economic benefits back to Queensland, including improved and accelerated translation of medical research into clinical and commercial outcomes.

- **Gold Coast Health and Knowledge Precinct:** An integrated and collaborative location for learning, research, knowledge creation and investment, and the commercialisation of newly developed biomedical and health technology. The rapidly growing precinct is located at Parklands in Southport and includes the state-of-the-art Gold Coast University Hospital, Gold Coast Private Hospital and Griffith University.
- **Health City Springfield Central:**  
An integrated health precinct which aims to deliver a health and wellness experience for the community through the provision

of quality healthcare, medical education and research as well as aged and seniors living—based around the Mater Private Hospital Springfield and Aveo Springfield.

- **Sunshine Coast Health Precinct:**  
The largest health infrastructure asset currently being developed in Australia—incorporating the Sunshine Coast University Hospital and Sunshine Coast University Private Hospital, together with the adjacent Oceanside Health Hub.

Health and knowledge precincts facilitate efficient transfer of knowledge between research institutes and industry, leading to increased innovation.

# Industry subsector snapshots

## Biopharmaceuticals

Queensland has a comprehensive biopharmaceutical research, development and commercialisation supply chain attracting biomedical companies to Queensland.

Queensland is home to the only two organisations in Australia with dedicated current Good Manufacturing Practice (cGMP) grade contract manufacture of biopharmaceutical active ingredients:

- **Patheon** was the first pilot-to-commercial scale biopharmaceutical manufacturing facility using mammalian cell lines in Australia. It employs more than 100 staff at its Woolloongabba, Brisbane, facility.
- **LuinaBio Pty Ltd**, located at Darra in Brisbane, complements Patheon's services by conducting cGMP manufacturing of biopharmaceuticals using bacterial cell lines.

The activities of the **National Biologics Facility** and the **ARC Training Centre for Biopharmaceutical Innovation** (University of Queensland, St Lucia) contribute another

important part of Queensland's biopharmaceutical supply chain. These organisations combine the expertise of the university with local industry to develop industry-ready scientists, many of whom are deployed into local companies.

Queensland is also home to businesses providing a comprehensive suite of preclinical and clinical trial services to support the development and commercialisation of new biopharmaceutical products:

- **Q-Pharm** at QIMR Berghofer Medical Research Institute/Royal Brisbane and Women's Hospital (QIMR Berghofer/RBWH): Comprehensive, high-quality, early-phase clinical trials
- **TetraQ** at RBWH: Quality assured preclinical and clinical testing
- **Q-Gen Cell Therapeutics** at QIMR Berghofer/RBWH: Good Manufacturing Practice (GMP) manufacturing facilities.

## Precision medical products

There is a growing demand globally for more personalised patient solutions, including medicines, medical technologies and diagnostics that best meet patient needs.

Queensland industry's integrated solutions are bringing together companies, researchers, clinicians and advanced manufacturers to capture a slice of this emerging market—facilitating the rapid commercialisation of new ideas and translation into clinical practice.

Collaborative ventures such as the Herston Biofabrication Institute (HBI), which combines next-generation 3D printing techniques with biological systems, will bring industry into clusters with cutting-edge research and clinical capability and health service delivery to develop high-value, high-knowledge, patient-specific medical technologies.

Anchoring Queensland's niche precision medical products sector is the globally connected new product

development and manufacturing capabilities at Cook Medical Australia, based in Brisbane. Cook Medical is manufacturing custom-made endovascular grafts for individual patients and exporting globally. Also launched out of Brisbane is the innovative 'home-grown' company DoseMe, which has developed a tool that calculates a precise and personalised dose of a medication for every patient, and Brisbane has recently become home to the headquarters of the Beijing Genomics Institute's Asia-Pacific expansion.

The state is leveraging significant research capability in the development of novel biomarkers, companion diagnostics and individualised treatments for many of our most devastating or complex diseases.

With a strong base already established, the state is in a good position to capitalise on global demand of this more personalised, targeted and preventative approach to medical treatments.

## Infectious diseases and biosecurity

The tropics currently account for 20 per cent of global economic output and that output is growing at a faster rate than the rest of the world.

The sum of the world's tropical economies (the global tropical product) is projected to reach US\$40 trillion by 2025—20 times Australia's projected gross domestic product. It is estimated that 25 to 30 per cent of this will be spent on importing goods and services and even more on developing new industries.

The demand for global tropical products, combined with Australia's reputation as a quality provider of health care and biosecurity within a region in which the middle class is predicted to grow from 300 million to 3 billion people within 40 years, offers significant market opportunities for Queensland's biomedical sector.

Northern Queensland in particular has a unique ability to progress advanced bio and technological solutions from discovery and pre-clinical studies to system-wide application. Its location in the tropics means it is closer to markets, closer to the state's tropical biodiversity and closer to dedicated tropical health and medical infrastructure.

It also has significant research capacity at the Australian Institute of Tropical Health and Medicine (AITHM) at James Cook University, the Cairns Institute, and the Tropical Australian Academic Health Centre (TAAHC).

The AITHM is Australia's leading medical research institute dedicated to outputs that improve the health and well-being of people in the tropics. With a focus on infectious disease, chronic disease, capacity and expertise in new therapeutics, along with vaccine

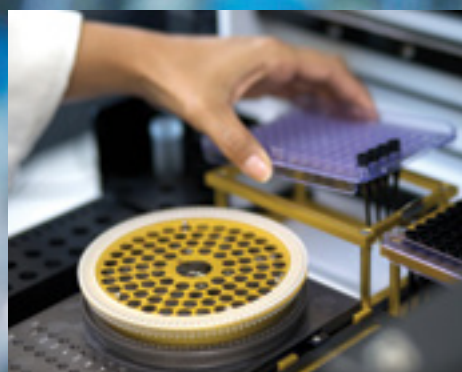
candidates, new diagnostics and clinical trials underway, the AITHM is uniquely positioned to translate and commercialise targeted research outputs to these growing tropical markets.

The TAAHC is creating the world's only tropical academic health centre targeting real health needs through collaboration between:

- Cairns and Hinterland, Mackay, North West, Torres and Cape, and Townsville Hospital and Health Services;
- the Northern Queensland Primary Health Network; and
- James Cook University, particularly the Australian Institute of Tropical Health and Medicine.

The centre identifies and enables translation of research ranging from new models of care, telemedicine and potential therapeutics to new interventions into tangible health outcomes. A key focus of TAAHC in addition to enabling research translation within acute care settings, is on population health and health services research, which are likely to drive the greatest impact on rural and remote health outcomes as well as health service efficiency.

The solutions developed in northern Queensland to address health security challenges and improve health care delivery to geographically dispersed populations can be adapted to suit other countries in our region, particularly in the Asia-Pacific, providing opportunities for locally-based individuals and organisations to engage in the development of infectious disease solutions as an export industry.





# The global picture

The biomedical market is a global one. With a population of only 24 million,<sup>2</sup> Australia does not have a large enough domestic market to support many companies in the industry and needs to be a competitive part of the global market to succeed.<sup>3</sup>

The medical technologies and pharmaceuticals (MTP) sector must be considered in the context of the global market. Australia represents only about 1% of global pharmaceutical and medical device sales.<sup>4</sup>

To achieve its vision Queensland needs to become the preferred choice in specific stages of the global industry value chain, which is forecast to undergo steady growth over the next four to five years driven by the seven global megatrends identified by CSIRO in its *Medical Technologies and Pharmaceuticals Roadmap*.

The industry outlook over the coming years is very positive. However, there is increased competition with more countries taking a share of the global market and a need for industry players to adapt in an industry undergoing rapid change.<sup>5</sup>

## Global industry drivers



Managing chronic disease



Personalised healthcare



Global biosecurity



Consumer control



Digital evolution



Emerging markets



Integrated healthcare



### Medical devices



Growing at **5.2%** to reach  
**US\$529.8 billion** in 2022<sup>6</sup>  
Sales of **US\$371 billion**<sup>7</sup>

### Vaccines



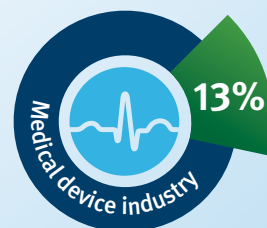
Predicted to increase to  
**US\$100 billion**  
by 2025<sup>13</sup>

### Pharmaceuticals



Growing at **4.6% p.a.**  
to reach **US\$1.5 trillion** in 2021<sup>8</sup>  
Revenue of **US\$1.2 trillion p.a.**<sup>9</sup>

### In vitro diagnostics



The leading medical device  
subsector, with sales of

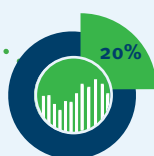
**US\$48.4 billion p.a.**,  
comprising **13%** of medical devices sales<sup>14</sup>

### Biopharmaceuticals



Revenue of  
**US\$163 billion**  
comprising **20%** of the  
pharmaceutical market<sup>10</sup>

Predicted to remain strong,  
with growth of **8% p.a.**<sup>11</sup>



Expected to reach  
**US\$70.8 billion**  
**in 2022**

and to continue as the leading  
medical devices subsector<sup>15</sup>

# Australia's biomedical industry

## Pharmaceuticals industry

Exports of

**AU\$3.89 billion<sup>16</sup>**



**1,563 people**

employed in manufacturing<sup>17</sup>

## Medical devices industry

Exporting to 167 countries<sup>18</sup>

Value of exports

**AU\$2.1 billion<sup>19</sup>**

## Medical technologies and pharmaceuticals industries

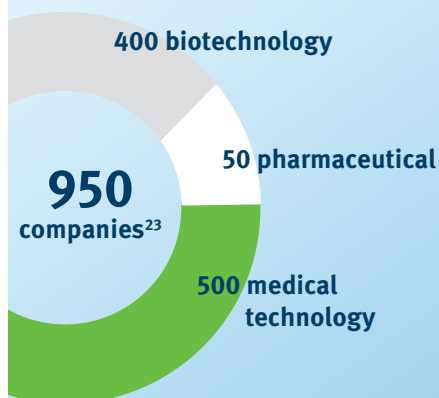
**AU\$4.4 billion GVA in 2015<sup>20</sup>**

Manufacturing exports in 2015<sup>21</sup>

**AU\$46 billion**

## Medical technologies, pharmaceutical and biotech

Employing  
**32,000 people**  
(as well as 16,000 people in  
health and medical research)<sup>22</sup>



## Complementary medicines industry

Industry valued at

between AU\$3.9 billion

and AU\$4.2 billion<sup>24</sup>

Growing at **4.8% p.a.**<sup>25</sup>

## Biotechnology industry

Generating  
revenue of  
**AU\$7.3 billion<sup>26</sup>**

Growing at  
**4.3% p.a**  
to reach AU\$9.1 billion  
by 2021–2022<sup>27</sup>

The industry is a significant contributor to Australia's economy. It is estimated that there are about 50 global research pharmaceutical companies, 400 biotechnology companies and 500 medical technology companies operating in Australia.<sup>28</sup>

The industry employs 32,000 highly skilled workers (another 16,000 are employed in health and medical research) generating significant income from exports as well as investment in research and development in Australia.<sup>29</sup>

The Australian Government's \$250 million Industry Growth Centres

Initiative identifies the medical technology and pharmaceutical (MTP) sector as one of six key areas of competitive strength and strategic priority. In November 2015, MTPConnect was established as an independent, not-for-profit organisation championing a sector-led approach to accelerate the growth of Australia's MTP sector. In December 2016, MTPConnect released the *Medical technology, Biotechnology and Pharmaceutical 10-year Sector Competitiveness Plan* (SCP), which addresses growth priorities required to improve the Australian sector's competitiveness and productivity.

CSIRO recently released its *Medical Technologies and Pharmaceuticals Roadmap* that seeks to complement MTPConnect's SCP by assessing longer-term opportunities for growth, drawing upon the SCP to define enabling actions that will position the sector for sustainable and achievable growth.

This roadmap aligns with the SCP and CSIRO roadmap where possible and includes actions for the state government to work with MTPConnect on projects that will benefit Queensland industry.

## Case study: Leveraging industry opportunities provided by MTPConnect

MTPConnect has implemented a range of programs with potential collaboration opportunities for Queensland industry and the Queensland Government is working closely with industry to take advantage of these opportunities.

- **Bridge Program**—Queensland entrepreneurs and business-savvy researchers can connect with, and learn from, global leaders in the pharmaceutical industry to better understand how to navigate the path to market for new medicines and to accelerate the process of commercialisation.
- **Cancer Therapeutics CRC**—A consortium, including the Queensland Emory Drug Discovery Initiative (QEDDI), will provide Australian organisations access to many of the tools, facilities and expertise needed to develop new treatments for cancer.
- **Vaxine Pty Ltd**—Queensland has well-established capabilities across industry and research in the development of new vaccines. Supported by MTPConnect, Vaxine Pty Ltd is working with Queensland biomedical organisations as part of a national audit of vaccine research capabilities and relevant services across Australia.
- **Herston Biofabrication Institute (HBI)**—MTPConnect is supporting a partnership between the Queensland University of Technology and Metro North Hospital and Health Service that will bring together industry partners, researchers, clinicians and engineers to develop next generation biofabrication technologies leading to novel medical solutions.

Ranked fifth in the world for biotechnology innovation potential, Australia's biomedical industry is underpinned by a number of competitive advantages, including the:

- Research and Development (R&D) Tax Incentive
- Clinical Trial Notification Scheme (CTN)
- Therapeutic Goods Administration (TGA) strict compliance standards.



### R&D Tax Incentive

Benefits Queensland's biomedical industry, making it attractive to investors

Reduces cost of undertaking R&D, encouraging more engagement

Matches international competitors' schemes

Industry is very supportive of the scheme and its important role in attracting overseas business and industry engagement

### Clinical Trial Notification Scheme

Efficient, cost-effective regulatory pathway for clinical trials, which translates into some of the earliest start-up times in the world<sup>31</sup>

### TGA compliance standards

Regarded internationally as a high-quality regulator of medicines and medical devices<sup>30</sup>

Strict standards ensure international confidence in products, particularly in developing and Asia-Pacific countries

Used as benchmark internationally, with representatives regularly called upon to provide training and expertise to international regulators<sup>32</sup>

Complementary medicines highly regarded in the Asia-Pacific region due to strict regulatory processes for this sub-sector



## Case study: Patheon Biologics

Patheon Biologics is a member of the Patheon family of global contract pharmaceutical development and manufacturing organisations. The company is the flagship of Queensland's growing high-value niche biopharmaceutical research, development and commercialisation supply chain, supporting international and local biopharmaceutical companies to progress their innovative discoveries into drugs of the future.

Patheon Biologics has recently undertaken a successful pilot to scale current good manufacturing process (cGMP) manufacturing of biopharmaceuticals using mammalian cell lines at its Brisbane facility. The company is one of only two in Australia, both of which are located in Queensland, with dedicated cGMP biopharmaceutical manufacturing capabilities. With the global biopharmaceuticals and biosimilars (generic biologics) markets expected to grow to US\$290 billion and US\$25 billion respectively over the short to medium term, Queensland is uniquely positioned to establish itself as the leading supplier in the region.<sup>33</sup>

Many national and international biomedical businesses have come to Brisbane to access Patheon's contract manufacturing services, attracted by the company's quality reputation, the Australian Government's R&D Tax Incentive and Australia's efficient regulatory pathway. As a result, the company has experienced substantial growth since its establishment in 2013, with jobs numbers doubling over the last two years.

The growth of Patheon has also had flow on effects with a number of Patheon's customers going on to establish relationships with local service providers supporting biopharmaceutical product development.

Queensland is rapidly becoming a hub for the training and development of industry ready scientists in this niche sub-sector and Patheon Biologics is at the centre of this development. The company has provided an opportunity for many Queensland biomedical scientists and engineers to work for a global biomedical enterprise, developing highly transferable, commercially relevant skills. The company is also exporting Queensland trained staff to Patheon's many manufacturing and development facilities around the globe, gaining invaluable international industry experience.

## Case study: Regional approach to clinical trials – Sunshine Coast model

The University of the Sunshine Coast's Clinical Trials Centre (CTC) in partnership with local healthcare providers is developing an efficient and effective regional approach to attracting and conducting industry-sponsored drug and device clinical trials across the Sunshine Coast. The model aims to grow the region's clinical trials ecosystem by supporting the training and development of existing clinicians and expanding the region's capabilities and capacity to undertake an increased number of trials.

The regional strategy employs a single portal of entry and a centralised model for resourcing trials without the need to replicate all the functional capabilities. This provides a more cost-effective approach, with the proceeds from trial activities shared between the CTC and each partner site.

The model involves partnering with and leveraging the existing health capabilities within primary care, specialist medicine, cancer centres and private hospitals to activate new environments to be ready to conduct a range of sponsored clinical trials. The roll-out of the initial model design by the CTC over two years has been successful in attracting 150 inbound trial opportunities which ranged from phase I to IV drug and device clinical trials.

## Streamlining process and reducing timeframes (Sunshine Coast Clinical Trials Centre)



### Ethics approval



Less than two weeks



Using the external provider Bellberry – a Best Practice example of Research Ethics Committees



### Governance approval



Approval within two to five days



Approximately 50 to 75 per cent faster than most sites locally and nationally, including the United States Food and Drug Administration (FDA)



### Participant recruitment



Within four to six weeks, on average, from ethics submission to first patient on study



One of the fastest systems in Australia using a suite of recruitment strategies

# Strengths and opportunities

The Queensland biomedical industry's existing strengths, combined with the transformation investments under Advance Queensland and strategic new actions, provide a strong platform to propel the industry for growth.

## High-value niche businesses specialising in biopharmaceuticals, medical devices and complementary medicines

Queensland is home to a cluster of **high-value niche businesses** specialising in:

- biopharmaceuticals and biologics
- generic pharmaceuticals
- complementary medicines
- medical devices
- point-of-care diagnostics.

## World-class research base and state-of-the-art translational research facilities and hospitals

Queensland has a **world-class research base and state-of-the-art translational research facilities and hospitals** which are creating a critical mass of knowledge generation, attracting international attention and recognition.

This infrastructure puts Queensland at the forefront of the convergence of technology and healthcare and gives it the agility to take advantage of the opportunities provided by disruptive innovation.

Queensland's **health and knowledge precincts** have demonstrated their ability to facilitate increased

innovation through a greater transfer of knowledge between research institutes and industry. A key opportunity exists for Queensland to build on the strengths of each precinct and refine the framework for collaboration and information sharing.

Health data and advances in science and technology, particularly the dramatic decrease in the cost of DNA sequencing, is making personalised healthcare solutions increasingly feasible and affordable. As home to Australia's largest health service provider, Metro North Hospital and Health Service, Queensland is in an ideal position to use health data to accelerate the development of new technologies, products and services.

'The future of the biomedical industry over the next 10 years will depend on activities that are not in existence today. Efforts to bring more opportunities to the fore should be based on the key asset of Queensland – that is, its skilled workforce.'

**QIMR Berghofer Medical Research Institute**

## Excellent education system that produces highly-skilled clinicians and technical professionals

Queensland's biomedical sector is supported by a **highly educated specialist workforce** and a demonstrated high retention rate, making it an attractive alternative to other Asia-Pacific industry hubs. This highly skilled professional workforce drives the development of novel products and services combining disciplines such as electronics, information and communications technology (ICT), data management and biomedical engineering and material sciences.

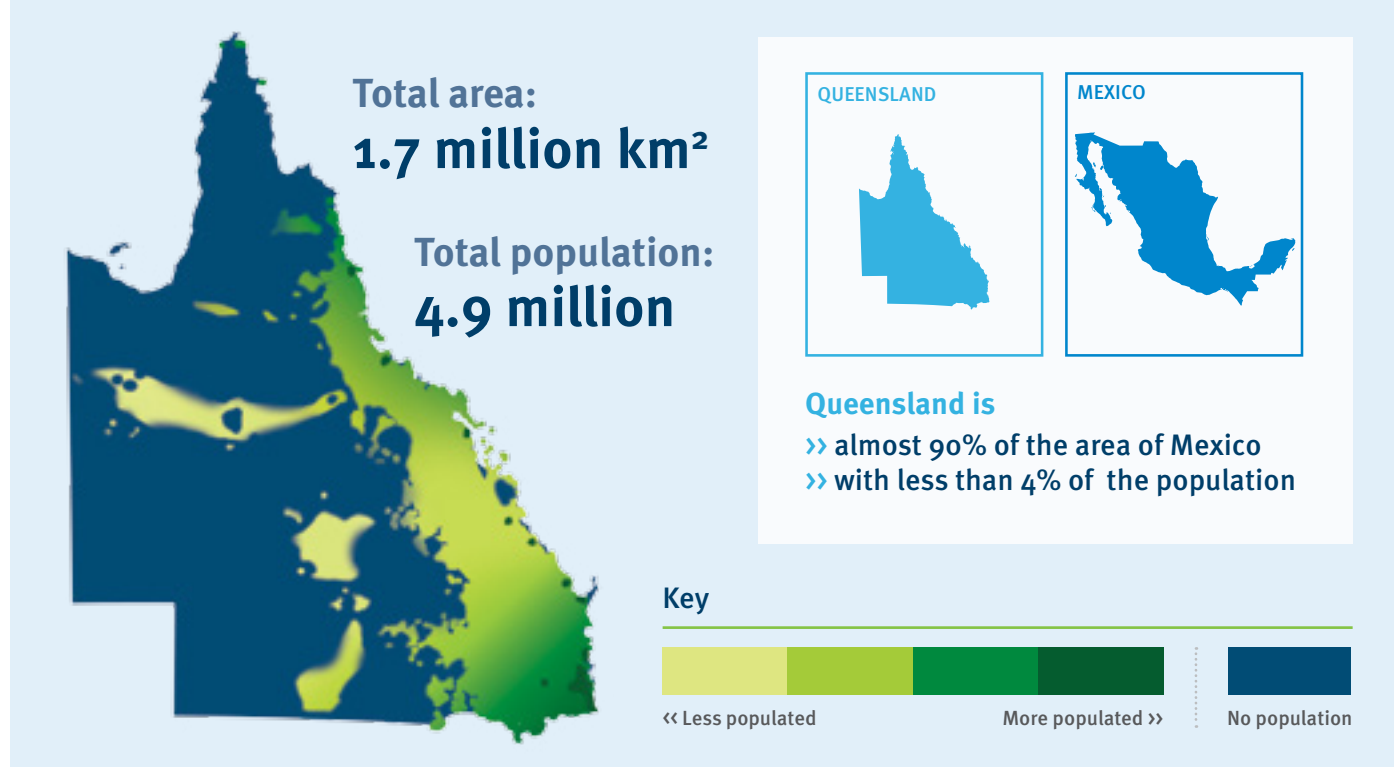
## Established network of industry support service providers

In the biomedical sphere, speed to market and regulatory knowledge is critical. Queensland recognises the importance of a responsive supply chain and hosts an **established network of specialist service providers** in specific stages of the chain.

## Geographic size, location and tropical climate

Queensland's **large geographical size** creates an environment that encourages business opportunities

## Queensland's dispersed population



in digital health technologies, including:

- connected devices
- remote monitoring technology and point of care diagnostics
- wearable devices
- telehealth solutions.

Queensland's geographic position as the gateway to the Asia-Pacific region, its extensive coastline and the suitability of its climate mean it will continue to be at the frontline of dealing with biosecurity and health security threats. Given the **diverse patient population** of Queensland, its **pre-clinical and early phase clinical trial capabilities**, **world-class research base** and **state-of-the-art translational facilities** (including world-class infectious diseases research laboratories), Queensland is well-positioned

to respond to emerging global biomedical threats. The Queensland biomedical sector has a strong role to play in the advanced development and manufacture of medical countermeasures (MCM) products, including point-of-care diagnostics, vaccines and therapeutics for protection against emerging infectious diseases and pandemics (particularly those of tropical origin). The Australian Government is committed to a strategic national response to strengthen Australia's MCM preparedness and Queensland biomedical companies and research institutions are contributing to a national audit of capability and capacity to support MCM product research, development and manufacture in Australia.

The strong nexus in Queensland between its agricultural diversity

and biomedical capabilities enables industry to respond to the growing demand for health and wellbeing around the world, especially in the Asia-Pacific region, including functional foods, nutraceuticals and natural products.

An opportunity exists to leverage the state's reputation as a popular destination for events and conferences, attracted by Queensland's strategic position in the Asia-Pacific region and attractive subtropical and tropical location. Internationally focussed biomedical events and conferences present an opportunity to link the state's biomedical ecosystems with global industry leaders, supply chains and expertise and to develop critical business relationships that will boost exports and attract new investment to Queensland.



Advance Queensland continues to position Queensland strongly as an innovation destination – a start-up state with a strong entrepreneurial culture, world-class research and increasingly agile and innovative businesses. Queensland is becoming increasingly well known as a place for turning great ideas into commercial outcomes.

Advance Queensland initiatives provide support for existing and emerging industries in the state. The biomedical sector is no exception, with a range of significant cutting-edge projects already underway across industry and research.

# Industry challenges

While there are significant strengths and opportunities for the biomedical industry in Queensland, consultation feedback indicates there are challenges that need to be addressed.

## Access to commercial biomedical expertise

There is a significant gap in appropriate skills needed to translate research into successful commercial outcomes.

The biomedical ecosystem in Queensland is still at an early stage of development. Financially constrained small and medium enterprises (SMEs) have difficulty funding, attracting and engaging executives and managers or skilled advisors. Researchers and researcher-founded start-ups have the technical expertise but often lack the business acumen and experience needed to assess the commercial potential of their research or capability and to successfully take a product or service from concept to market.

Talented individuals with appropriate experience and established global networks are critical to translating research into commercial outcomes within the highly regulated environment and complex global market.

## Access to investment capital

A lack of access to long-term, low-return investment capital is a significant barrier to commercialisation, particularly in the early stages of product development. Funding shortfalls in the pre-clinical and early clinical development stages are common.

Queensland needs to attract investment in its local start-up community to secure its comparative advantage in this sector. Start-ups are vital to innovation and creating an entrepreneurial culture. They are also important in creating high knowledge jobs, particularly as they scale-up to SMEs.

Consultation has made clear the need to focus on areas where Queensland has unique strengths and capabilities or areas where there is demonstrated clinical or market need.

## Access to markets

For Queensland industry to continue to grow and remain sustainable, it needs to launch its products on the global market. To do this requires industry to navigate a range of international regulations and processes.

Consultation has demonstrated that industry faces difficulties in navigating global markets and often does not have the necessary skills. Developing an understanding of different global regulatory environments is complex and often requires significant investment to ensure compliance with global regulations.

Local industry often also needs a proven record of demand and supply to underpin marketing strategies when seeking to enter international markets. The lack of local customer demand for innovative biomedical

services or products has been identified as a major barrier to business performance. The lack of a local market not only makes it more difficult to enter global markets but also can make it difficult for start-ups to grow into larger companies and can place them in direct competition with other start-ups.

Queensland Government procurement processes may be a way to facilitate this, with opportunities to enable Queensland-based innovators to test new products, make sales to early adopters and diffuse proven innovations to a broad customer base.

## Business-to-business collaboration and connectivity between clinicians, industry and researchers

Collaboration is a critical factor for success. Although collaboration is improving as a result of Advance Queensland initiatives, more focus on early collaboration of both research-to-industry and business-to-business is required.

Early collaboration is critical to ensure product development follows necessary processes to meet both end-user needs and strict national and international regulatory requirements.

Novel solutions in this sector are often discovered from cross-disciplinary collaboration

with the convergence of disparate fields of science and technology.

Nurturing these relationships presents challenges. These include different incentive structures and goals driving researchers and businesses, and businesses unaware of complementary capabilities available in the local market.

Networking, plus strong, connected clusters are two mechanisms that can assist and improve the culture of collaboration between complementary businesses, Queensland's well-established research institutes and its world-class healthcare service providers. This will pave the way for the realisation of the hospitals of the future, specialising in

distributed manufacturing of customised implants, developed in close collaboration with clinicians, patients and multidisciplinary experts.

### **Awareness of industry and its capabilities**

There is a real need to capture Queensland's biomedical capabilities and raise the sector's profile.

Industry has identified the need to create a more unified market proposition to capture the attention of the institutional investment community, and a role for government in promoting the sector to local and global markets. Better exploitation of Queensland's

strengths to attract business is a possible solution, such as Queensland being a prime base to enter other markets (particularly the Asian market), with a strong reputation and rigorous regulatory standards and traceability of ingredients.

Trade & Investment Queensland through its Queensland *Trade and Investment Strategy 2017–2022* (the strategy) is working to position Queensland as Australia's most innovative and dynamic trading economy, with a focus on Queensland's industries of the future, including the biomedical industry. This roadmap will support the strategy.

## **Case study: Cook Medical Australia's Asia-Pacific Commercialisation and Development Centre**

Cook Medical Australia's new Asia-Pacific Commercialisation and Development Centre (ACDC) gives businesses, entrepreneurs and researchers from across the region the opportunity to collaborate with the ACDC to develop and commercialise innovative medical devices and technologies with global market potential.

The ACDC, launched by Cook Medical in February 2017 and located in Brisbane Technology Park, will provide a supportive business environment and assist with overall industry development. The centre, with its world-class business facilities and resources, provides innovators with access to advanced equipment, technical expertise, laboratory facilities, internet and general office space and resources. Participants will have access to a range of resources and mentors needed to develop medical devices and technologies, including advice on business planning, clinical pathways, intellectual property, industrial design, quality assurance, regulatory pathways, supply chain, finance and market analysis.

With its focus on collaboration, the ACDC aids enhanced interactivities between participants through its state-of-the-art video conferencing facilities and a multipurpose event space that can be used for training, workshops, special lectures and networking events.

Advisors at the ACDC are sourced from Cook Medical and are knowledgeable, passionate and committed to developing healthcare solutions. With over 50 years' experience in developing minimally invasive technologies, today Cook Medical offers medical devices, biologic materials, biopharmaceuticals and cellular therapies to deliver better patient outcomes more efficiently.

# Actions to date

## Advance Queensland

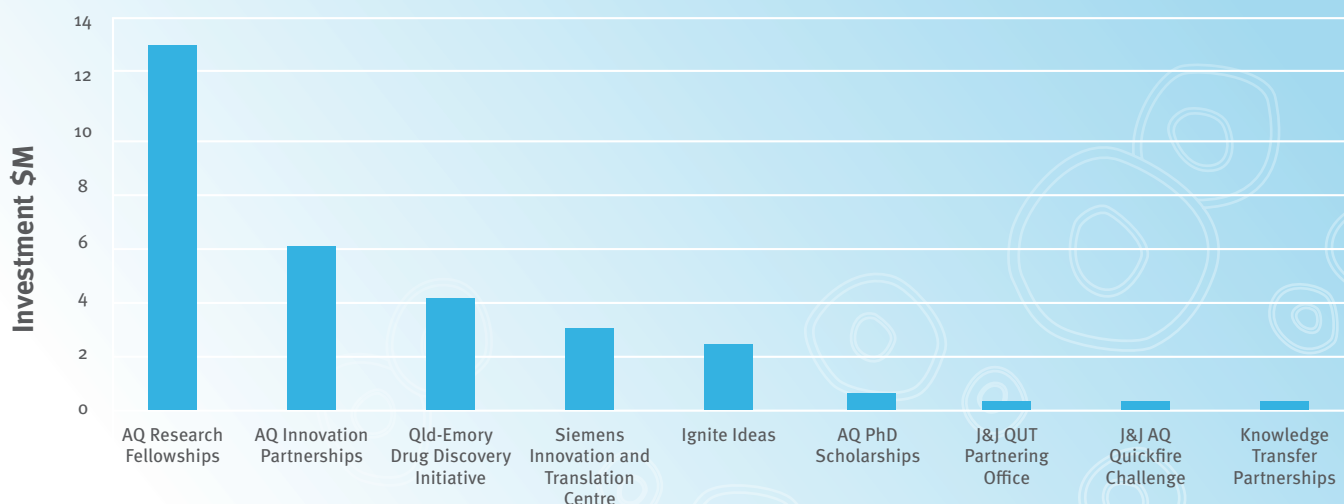
The AU\$420 million Advance Queensland initiative is building an environment where collaboration between industry and research bodies successfully translates ideas and research into commercial outcomes, new and growing business, and jobs. These initiatives are of particular interest to the biomedical sector:

- **Business Development Fund** turns ideas into reality with co-investment in emerging and high-growth Queensland businesses at the forefront of commercialising innovative research or ideas.
- **Ignite Ideas** supports the development of new or improved products, processes or services to secure investment, launch into global markets and grow business.
- **Industry Attraction Fund** harnesses growth in emerging industries and value-adds to existing industries through providing funding to encourage businesses to relocate to or establish new projects in Queensland.
- **Innovation Partnerships** positions Queensland as a global innovation hub with grants to Queensland research organisations to collaborate on research projects with industry.
- **Innovation Quick Fire Challenge (in collaboration with Johnson & Johnson)** awards up to three new early-stage human healthcare inventions with an award

of AU\$100,000 each and access to mentorship and coaching from Johnson & Johnson staff.

- **Knowledge Transfer Partnerships** builds collaboration between universities and small business by bringing on a university graduate to work on an innovative project.
- **Platform Technology Program** provides financial incentives to larger scale co-funded projects that accelerate the development and deployment of significant and highly collaborative industry-based platform technology projects.
- **Queensland Genomics Health Alliance** a AU\$25 million boost to genomics research that encourages collaboration between experts and industry to lead to practical outcomes that can improve the health of Queenslanders.
- **Queensland Start-up Events and Activities Fund** builds capability within Queensland's start-up community with funding of up to 50 per cent of total activity costs.
- **Research Fellowships** supports PhD-qualified researchers to undertake original research that will have benefits for Queensland and will attract and keep talented researchers in Queensland.
- **Young Starters Fund** funds eligible organisations to deliver events and activities that build entrepreneurial and start-up skills in young Queenslanders.

## Advance Queensland grants towards biomedical research





## Supporting advanced manufacturers

Advanced manufacturers within Queensland's biomedical sector contribute significantly to the state's economic growth and prosperity. The Queensland Government is committed to supporting these businesses and recognises the potential to capitalise on opportunities in niche areas of knowledge-intensive manufacturing.

On 14 December 2016, the Queensland Government released the *Queensland Advanced Manufacturing 10-Year Roadmap and Action Plan* (the advanced manufacturing roadmap), which identified four initiatives to assist these businesses to grow and innovate.

- **Advanced Manufacturing Benchmarking Program** assists businesses measure performance and practices to identify areas of improvement.
- **Boosting Business Productivity Program** uses workshops and forums to strengthen business methods and increase participation in global supply chains.
- **Advanced Manufacturing Transition Package** stimulates digital business capability through workshops and forums hosted by successful best practice organisations.

- **\$20 million Made in Queensland Program** offers grants of between AU\$50,000 and AU\$2.5 million to support manufacturers become more internationally competitive and adopt innovative processes and technologies.

The biomedical industry is already receiving support as part of Made in Queensland to undertake a benchmarking program to help industry become more competitive and create high-value jobs for Queenslanders.

The advanced manufacturing roadmap will ensure more Queensland biomedical manufacturing businesses can seize opportunities to supply high-value goods and services into global supply chains and export markets.

## Life Sciences Queensland

The key industry-led organisation Life Sciences Queensland (LSQ) works closely with all levels of government providing leadership, growth and promotional opportunities for its member organisations. The Queensland Government strongly supports close industry partnerships such as those fostered by LSQ, and recognises the valuable opportunity these relationships bring to help inform future initiatives to position Queensland as a successful global performer.

## Future actions

To address the challenges facing industry and capitalise on industry's strengths and opportunities, the roadmap sets out key strategies and associated actions. The Queensland Government is committed to and supports the strategies to achieve our vision and secure the economic prosperity of our state.



Challenges/Opportunities	Actions	Strategies
Limited access to investment capital	Biomedical Assistance Fund	<b>Strategy 1:</b> Support Queensland's start-ups to prosper and successfully scale-up
Limited access to commercial expertise	'Lean Launchpad' incubator	
Access to use health data to accelerate the development of new technologies, products and services	Streamline access to data	
Enhance industry's national and global competitiveness	Facilitate the attraction of companies to Queensland	<b>Strategy 2:</b> Support existing businesses to grow and attract new businesses to Queensland
Strategic partnerships with international companies	Assist companies to become part of the supply chain	
Make the most of Queensland's world-class infrastructure and capabilities	Voucher scheme for national and international biomedical businesses	
Navigate complex global regulatory environments		
Novel solutions provided by cross-disciplinary collaboration	Biomedical networking events	
Connect industry leaders and accelerate commercialisation		
Build capability through sharing learnings and experiences	Online industry portal	
Increased access to local market	Identify possible opportunities under the Testing Within Government (TWiG) and Small Business Innovation Research (SBIR) programs	
Access to a range of funding programs and initiatives (both state and national)	Work with industry to enhance access to government programs	
Advocate for Queensland industry	Facilitate and promote opportunities for industry	
Limited awareness of Queensland's strengths and capabilities	Proactively raise the sector's profile	<b>Strategy 3:</b> Promote capabilities to attract investment and facilitate alliances
Gain access to new clients and supply chain partners		
Increase access to national and international markets	Facilitate international trade missions	
	Participate in trade shows and roadshows	
Develop trade and investment relationships	Attract key events/conferences to Queensland	
Globally market a unified Queensland value proposition	Assessment of regional biomedical capabilities and infrastructure	

# Queensland Biomedical 10 –Year Roadmap and Action Plan

Vision	By 2027, Queensland will be a regionally integrated and globally competitive Asia-Pacific biomedical industry hub recognised for its excellence in biomedical innovation, its highly skilled professional workforce, and world-leading translational medical research facilities.				
Strengths and opportunities	World-class research base and state-of-the-art translational research facilities and hospitals	Established network of industry support service providers	Geographic size, location and tropical climate	Excellent education system that produces highly-skilled clinicians and technical professionals	High-value niche businesses specialising in biopharmaceuticals, medical devices and complementary medicines
Challenges	Access to commercial biomedical expertise	Access to markets	Awareness of industry and its capabilities	Access to investment capital	Business-to-business collaboration and connectivity between clinicians, industry and researchers
Strategy 1 Support Queensland start-ups to prosper and successfully scale-up		Strategy 2 Support existing businesses to grow and attract new businesses to Queensland		Strategy 3 Promote capabilities to attract investment and facilitate alliances	
<ul style="list-style-type: none"><li>Establish a Biomedical Assistance Fund to support the development of a pipeline of investible products.</li><li>Implement ‘Lean Launchpad’ incubator to provide industry with commercialisation advice and access to industry mentors.</li><li>Streamline access to data through Queensland Health to inform new product development.</li></ul>		<ul style="list-style-type: none"><li>Promote Advance Queensland programs to attract companies to Queensland.</li><li>Establish a voucher scheme to provide national and international biomedical businesses access to Queensland’s biomedical infrastructure and capabilities.</li><li>Facilitate biomedical networking events focussing on connectivity and collaboration to facilitate the building of long-term sector relationships.</li><li>Work with Queensland Health to identify possible opportunities under the Advance Queensland TWiG and SBIR programs and promote opportunities to SMEs and innovators.</li></ul>		<ul style="list-style-type: none"><li>Assist companies to capitalise on growth opportunities within the supply chain.</li><li>Develop an online portal to facilitate connectivity between businesses and promote industry capability.</li><li>Work with industry to enhance access to government programs.</li><li>Work with national entities to facilitate and promote opportunities for Queensland industry.</li></ul>	
				<ul style="list-style-type: none"><li>Proactively raise the sector’s profile through international trade shows and roadshows.</li><li>Facilitate international trade missions to identify opportunities for Queensland’s biomedical industry (with Trade &amp; Investment Queensland and Austrade).</li><li>Proactively attract key events/conferences to Queensland to build relationships, transfer knowledge and attract investment.</li><li>Undertake an assessment of regional biomedical capabilities and infrastructure, including health and knowledge precincts, to map areas of focus and develop a consolidated value proposition.</li></ul>	

# Notes

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