Australian Government

Medical Science

Co-investment Plan

Building manufacturing capabilities for the future

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Minister's foreword

Co-investment plans are a part of the Australian Government's commitment to secure a stronger future for Australian manufacturing. They bolster the government's plan to rebuild, modernise and diversify Australian manufacturing so that we continue to be a country that makes things to the benefit of the economy and local communities. Australia needs a vibrant manufacturing industry to improve economic resilience and build a smart and diverse economy.

The co-investment plans target the 7 priority areas of the economy identified by the government. They outline:

- promising areas for investment in the priority areas to support the development of high-value, sustainable manufacturing capabilities
- potential further actions to help build ecosystems that support manufacturing growth and competitiveness in the priority areas.

This co-investment plan for the medical science priority area sets out the government's commitment to back Australia's medical know-how to make more medical products here in Australia. We have world-class medical research capabilities and workforce. By building on our strengths and existing productive capacity, we can meet current and future needs and keep Australians safe and well.

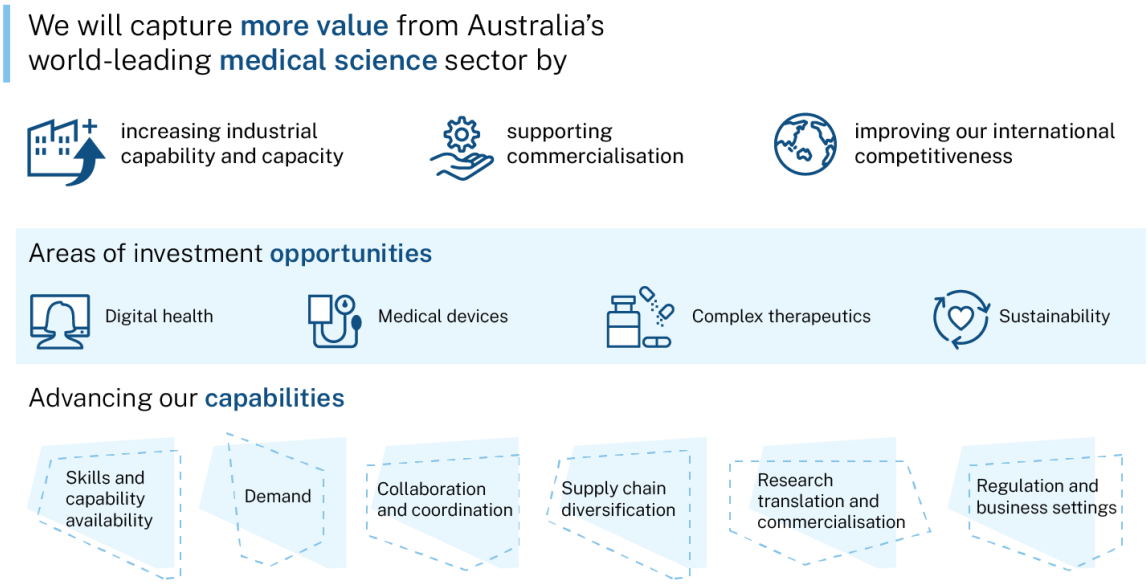
The co-investment plans are developed with industry and are a coordinated effort to ensure we seize future opportunities and create well-paid, secure jobs in suburban and regional Australia. The plans complement government initiatives to enhance innovation and expand domestic manufacturing. This includes the National Reconstruction Fund Corporation, which is one of the largest investments in manufacturing in our history. It also includes the Industry Growth Program, which delivers advice and grants to help start-ups and small businesses commercialise ideas and grow.

This plan was developed in consultation across government, industry, peak bodies, academia and unions. I thank the many people and organisations who provided expert advice to support this plan's development. The government is committed to continuing to work collaboratively with industry to transform and diversify Australian manufacturing.

The Hon Ed Husic MP
Minister for Industry and Science

Introduction

Summary



To support the development of manufacturing in Australia in the medical science sector, we will capture more value from our world-leading medical research by increasing our industrial capabilities and capacity, supporting the commercialisation of high-value products, and improving the international competitiveness of our medical science and technology sector.

Investment opportunities in medical science

Digital health includes the use of artificial intelligence, machine learning and other advanced technologies, advanced software solutions, and cyber security and health data collection solutions.

Medical devices includes the use of advanced manufacturing capabilities for speciality areas, robotics, non-invasive medical devices including smart and connected devices, and therapeutic-grade materials and components.

Complex therapeutics includes clinical trial infrastructure and capabilities, personalised medicines, and advanced research, development and manufacturing.

Sustainability includes additive manufacturing capabilities, circular economy principles, preventative healthcare and sustainable production.

Core areas in which to focus actions to advance Australia's capabilities

Skills and capability availability: Support end-to-end commercialisation experience and expertise in advanced manufacturing processes and emerging medical technologies. Attract international talent and support mobility across the medical product value chain.

Demand: Increase procurement opportunities for locally made medical products including through government purchasing power. Improve the transparency and efficiency of health and medical procurement systems. Support businesses to access global markets.

Collaboration and coordination: Increase collaboration and coordination between industry, research and government to unlock opportunities. Build international networks to promote Australia's medical industrial capabilities and attract international partnerships.

Supply chain diversification: Diversify and improve the transparency of Australia's medical supply chains to ensure they can meet the demands of future innovations and are resilient to disruption.

Research translation and commercialisation: Support facilities to de-risk and facilitate the translation of Australia's world leading medical research into innovative, high-value, commercial products. Improve translational expertise in university, research and clinical settings.

Regulation and business settings: Leverage Australia's strengths in regulatory trust and quality. Improve Australia's international competitiveness though streamlined regulatory approval and reimbursement processes.

Context

Australia is navigating a period of unprecedented change. Global megatrends such as climate change, digitalisation and geopolitical shifts are creating challenges and opportunities for Australian manufacturing.

As the global context evolves, Australia needs to be prepared to make the most of opportunities and continue to develop an internationally competitive, contemporary manufacturing capability. This requires focusing on Australia's strengths, targeting high-value market opportunities, and building an ecosystem that facilitates growth and competitiveness of Australian manufacturers.

Developing Australian manufacturing will improve Australia's resilience, create well-paid, secure jobs, and support economic growth. Manufacturing is a capability that applies to multiple industries. It drives innovation and productivity growth and adds value across the economy. It contributes 6.5% of all employment (931,400 jobs) (ABS 2023a) and 5.4% of gross domestic product (GDP) ($138 billion in gross value added) (ABS 2023b). A coordinated effort is needed to continue to grow a diverse and revitalised manufacturing industry that benefits the economy and local communities.

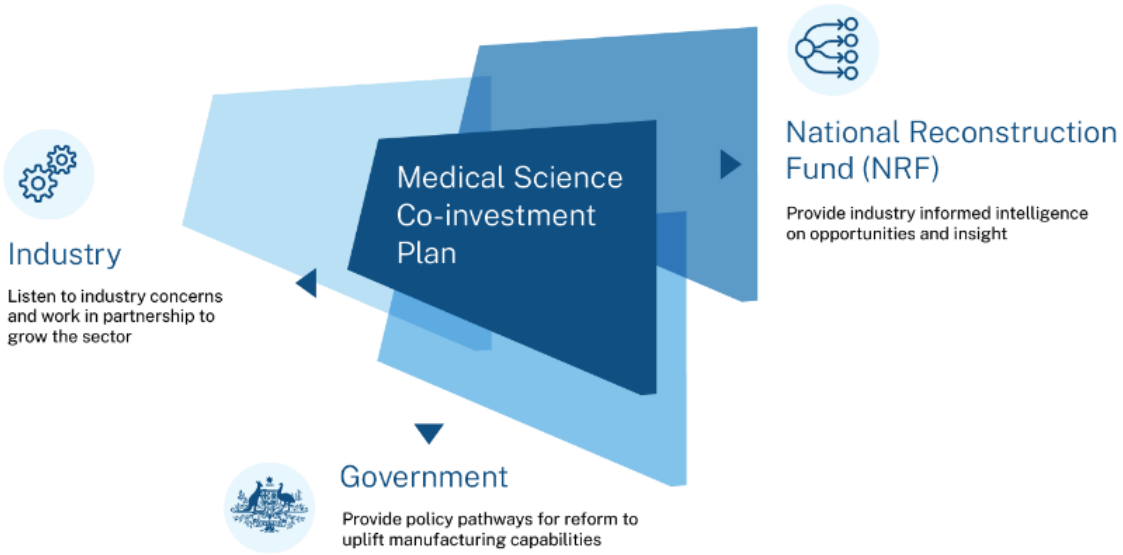
Purpose

Our purpose

To provide **insights** that can potentially inform investment opportunities and actions to support manufacturing in the **medical science** priority area

Aim

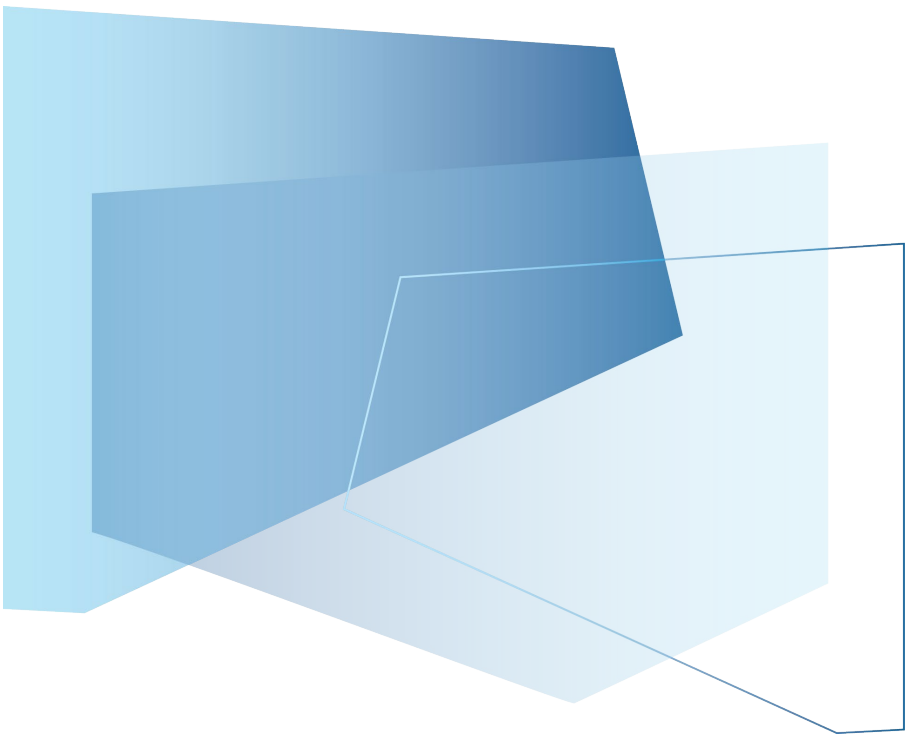
- Provide overview of current manufacturing activities and capabilities
- Identify international growth opportunities where Australia has a competitive advantage
- Identify opportunities to complement government objectives that have economic and strategic value
- Outline potential broader actions to build supportive manufacturing ecosystems



Each plan focuses on distinctive aspects of a priority area, however there are crossovers given overlapping opportunities and shared manufacturing issues. The government-identified priority areas are set out in the National Reconstruction Fund Corporation (Priority Areas) Declaration 2023 (Priority Area Declaration). They are:

- value-add in resources
- value-add in agriculture, forestry and fisheries
- transport
- medical science
- renewables and low emission technologies
- defence capability
- enabling capabilities.

This plan was developed by government in consultation with industry to provide insights that can potentially inform investment and other decisions and actions to support manufacturing in this priority area. This plan does not outline or direct National Reconstruction Fund Corporation (NRFC) investment. The NRFC Board will make investment decisions independently and consistent with its legislative framework, including its Investment Mandate.



Medical science priority area

Australia is a global leader in innovation and technology in the medical science industry. The industry has grown dramatically in scale and reputation over the last decade and is slated to continue that growth in advanced fields of science, engineering, and technology. By leveraging that medical know-how to make more medical products in Australia, we can access essential medical goods that support our wellbeing and prosperity, while creating a thriving and self-sustaining industry with global reach. Revitalising Australia's medical manufacturing capabilities can deliver long-term economic and social benefits, positioning Australia as a centre of excellence with global aspirations in areas of strength.

The medical science priority area is concerned with manufacturing a broad range of products for therapeutic use such as medical devices, medicines, personal protective equipment, and vaccines. The Medical Science priority area does not include products for veterinary purposes and is not intended to include products with possible secondary health applications, for instance, cosmetics or health food. The definition of manufacturing supports a broad understanding of the entire manufacturing process, from pre-production development to post-production services.

Strengthening industrial capabilities in medical science

Action statement

We will capture more value from our world-leading medical research by increasing our industrial capacity and capabilities, supporting the commercialisation of high-value products, and improving the international competitiveness of our medical science and technology sector.

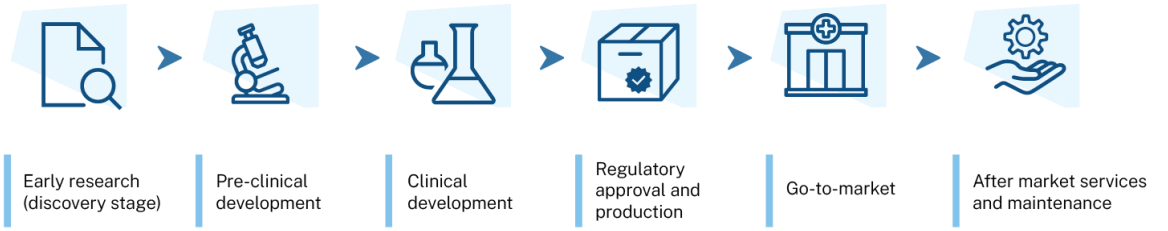
Australia's health and medical research is an outperforming sector – health science research in Australia is ranked 7th globally, and Australia is ranked 5th in the World Index of Healthcare Innovation (Springer Nature 2023). Australia has generated globally transformative medical innovations like the human papillomavirus vaccine Gardasil® and the Cochlear® bionic ear implant. Our medical science workforce has a global reputation for being adaptive, collaborative and open to new ideas and technologies. Australia also has a global reputation for clinical trials excellence. The medical science industry is an important and growing contributor to Australia's economy and was integral to Australia's response to the COVID-19 pandemic.

Despite Australia's strengths, the onshore translation of research into commercial products is limited. Australia was ranked last on OECD rankings for manufacturing self-sufficiency in 2020 (Stanford 2020), and the Australian medical science priority areas output is only 0.3% of the nation's GDP (ABS 2023c). Medical intellectual property (IP) is highly portable, and in a competitive and globalised market, much of Australia's medical IP is exported for commercialisation in more competitive economies. Without a full value chain medical science ecosystem, much of the potential economic and strategic value of domestic production and post-production activities is lost. Commercialisation challenges also limit industry growth, as smaller companies struggle to advance product development and generate returns. Our limited sovereign medical capability also means we rely on imports for medical products, precursors and components, making us vulnerable to disruptions.

The government is committed to working with industry to transform and diversify medical science in Australia. We must take advantage of global opportunities in medical innovation, support skilled jobs, and conduct end-to-end product development and production onshore. This transformation will be underpinned by strengthened pathways between academia and industry, digitally enabled product development and infrastructure, and national coordination across the medical ecosystem.

Medical science in Australia

Australia's medical science industry includes a diverse range of activities across the therapeutic product value chain, from early-stage product development to after-market services and maintenance. Production activities in medical science typically begin early in the value chain, as prototypes and clinical trial products are produced prior to clinical development. Medical manufacturing has strict regulatory certifications (for example, ISO 13845 certification and Good Manufacturing Practice (GMP) licence) requiring specialist experiences and resources.



Value chain of the medical science priority area of the Australian economy

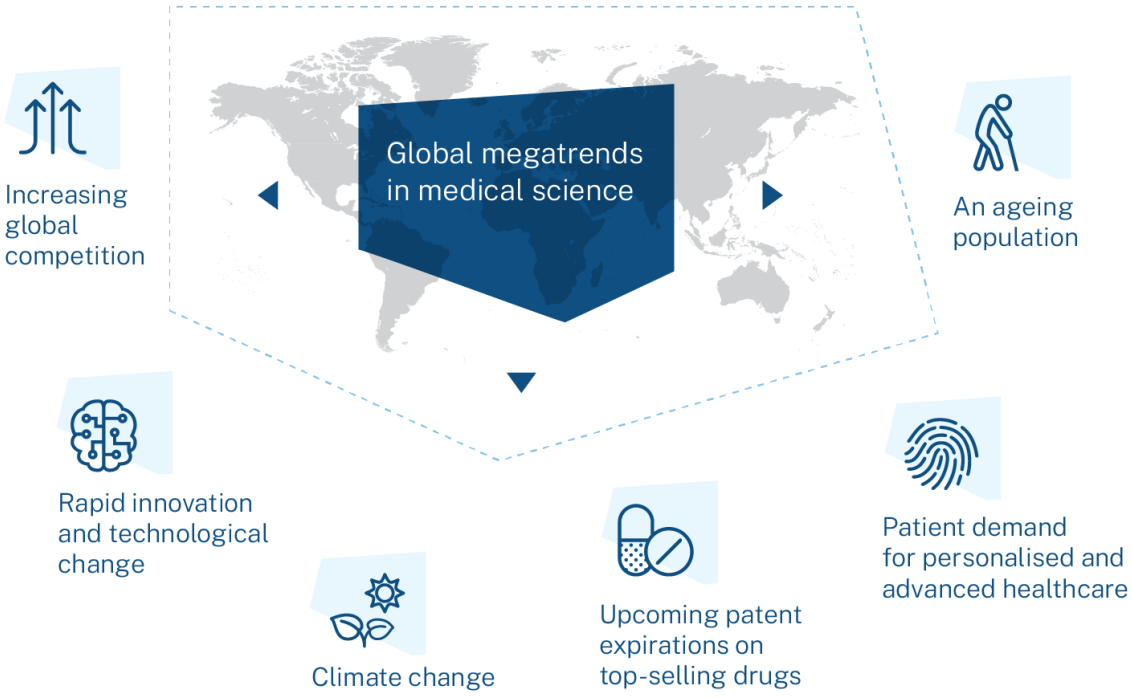
The industry encompasses a broad range of subsectors, including pharmaceuticals and biotechnologies, medical technologies, and digital health products. The value chains and markets for each subsector are similar. However, there are key differences in development timelines and costs, and how each subsector engages with global investors and markets. While each subsector has unique operating conditions and challenges, they are also closely related and there is a strong flow of information and ideas between manufacturers, research organisations, and the healthcare system. The medical science workforce is highly skilled, with approximately 80% of employees educated at a degree level or higher (Medicines Australia 2019).

Australian medical manufacturers are predominantly pre-revenue small and medium-sized enterprises (SMEs) in the process of translating medical research into commercial products (AusBiotech 2022). Medical SMEs are unique in that they can remain pre-revenue for many years while undertaking clinical trials and finalising regulatory approvals before products can enter the market. Medical product development is characterised by a suitably high regulatory threshold. This risk-based approach to medical product regulation ensures the safety, efficacy and quality of medical products. However, medical products can be high-value and deliver significant returns on investment if successfully brought to market. For example, the Gardasil® cervical cancer vaccine, developed at the University of Queensland and later by CSL and Merck & Co, dominates the HPV vaccine market and generated over US$6 billion in sales in 2022 (Merck & Co 2023).

Recent disruptions, like the COVID-19 pandemic, have highlighted the importance of a capable and agile sovereign medical manufacturing capability. Vulnerabilities in Australia's medical supply chains led to significant economic disruptions and risks to public health. Government and industry have a renewed focus on working together to strategically build Australia's industrial capabilities in medical science. For instance, Moderna's mRNA vaccine manufacturing facility, scheduled for completion in 2024, will be the first of its kind in the southern hemisphere (Allan 2023). By supporting Australian innovations and businesses, Australia can realise substantial economic returns and secure access to critical health products.

Economic and geostrategic trends

> Australia's **medical science** industry will be affected by global economic and geostrategic trends creating both opportunities and challenges for future investment and growth



Global competition in medical research and manufacturing is increasing as governments prioritise sovereign capabilities amid global disruptions. Large investments from countries like China, India and the US in medical research and production will increase international competition for resources, partnerships, talent and market share. The complexity of medical research and manufacturing limits the ability of any one country or organisation to span the breadth of the value chain.

An ageing population will challenge healthcare systems and increase demand for medical products and services that meet consumer needs. Australia's ageing population and increasing rates of chronic illnesses will have significant economic implications and necessitate substantial healthcare reforms. As the population ages and seniors' consumption grows, there will be an increased need for healthcare products catering to their specific needs.

Rapid innovation and technological change in areas like AI, machine learning and biomedical technology will create market opportunities in the sector to compete on quality and customisation, rather than mass production. Clinically safe advances could make healthcare cheaper, more effective, more personalised and more equitable. Further developments in AI and other emerging technologies also provide opportunities for preventative healthcare and connected diagnostics.

Climate change may increase the emergence and incidence of infectious diseases and pandemics. This is likely to increase demand for responsive and innovative healthcare solutions and sovereign medical manufacturing capabilities. Sustainability considerations, like low emissions technologies and circular economy advancements will reshape the delivery of healthcare.

Upcoming patent expirations on top-selling drugs will increase competition from generics and biosimilars. At the same time, the industry will shift focus to developing more high-value, low-volume medicines and biologics targeting specific or unmet medical needs. Multinationals will increasingly look for external innovations to replenish their portfolios, creating opportunities for local biotechnology companies.

Patient demand for personalised and advanced healthcare will drive demand for point-of-care and direct to consumer healthcare products. Advancements in this sector will also require secure handling of personal identifiable information (PII) and security of the collected data. Furthermore, the rise of digital natives and their preference for digital platforms and e-commerce could drive the demand for healthcare products accessible through online channels.

Australia's advantages

Australia's medical science industry has several competitive and comparative strengths that prime it for growth and transformation, including:

- **Leading clinical trial capabilities.** Australia is well-regarded for its specialised and efficient service providers and sites. Clinical trials in Australia benefit from the convenience and speed of the Therapeutic Goods Administration's (TGA's) – Clinical Trial Notification (CTN) and Clinical Trial Approval (CTA) schemes. Competitive clinical trial costs and similar attitudes and demographics to larger markets like the US make Australia an ideal testing environment.
- **A strong research ecosystem** primed for R&D capability building. Australia has over 1,200 pharmaceutical and medical technology companies, 55 medical research institutes and 40 universities focused on clinical research. The Australian government offers grants and incentives for medical R&D, including through the National Health and Medical Research Council's Medical Research Endowment Account, the R&D Tax Incentive and the Medical Research Future Fund. Australia also has strengths in research and talent in quantum computing and technologies that have applications within the medical science sector.
- **Leading therapeutic expertise.** Australia has many research organisations conducting world-leading therapeutic research in areas like oncology, immunology, neurology, and cardiovascular disease. Australian research is well regarded internationally, and Australia was ranked 7th in the world for human capital and research by the Global Innovation Index (WIPO 2023).
- **Globally respected and robust regulatory processes.** Australia has a reputation for manufacturing safe, high-quality medicines and vaccines under the requirements of the TGA. Australia also recognises and participates in programs and processes (including recognition programs) with other international regulators to reduce cost, regulatory burden and facilitate faster access to products on the Australian market.
- **A world-class healthcare system** and a mature healthcare market. Australia ranks 13th in the world in per-capita healthcare expenditure (World Bank 2023), stabilising the size of the domestic market in the face of a relatively small population base and facilitating access to innovative treatments and products.
- **Proximity and access to the growing export markets of the Asia-Pacific region**, supported by trade agreements and mutual recognition programs. Australia has entered into free trade agreements with Singapore (2003), Thailand (2005), Association of Southeast Asian Nations (2010), Malaysia (2013), Korea (2014), Japan (2015), China (2015), Hong Kong (2020) and Indonesia (2020).

Opportunities for investment

This section identifies high-potential opportunities that align with the government's policy objectives to inform investment decisions in the priority areas. The investment opportunities aim to scale existing manufacturing capabilities that play to Australia's strengths or develop new capabilities where Australian manufacturers can compete and capture demand.

The high-level investment opportunities outlined below have been made in consideration of those advantages and their alignment with broader priorities for the Australian Government. This includes net zero objectives, circular economy, and supply chain resilience considerations. Further details about the development of investment opportunities can be found in *Appendix B*. An outline of the medical science investment landscape can be found in *Appendix C*.

Digital health

Digital health is a broad and rapidly growing sub-sector with increasing market demand and investor interest, both in Australia and globally. Examples of digital health and its applications include eHealth, hospital information systems (HIS), telemedicine, health informatics and wearables and sensor devices. An ageing population and increased incidence of chronic diseases will increase demand on healthcare systems domestically and internationally. Digital health solutions will be a key aspect of how healthcare systems and workforces transform to respond to this growing demand, improve patient outcomes and reduce costs.

Australia is well placed to be a strong competitor in digital health due to its engineering and science capabilities in areas like telehealth, digital medicine, digital therapeutics, mobile health, artificial intelligence and wearable technologies. The Australian Digital Health Agency and its National Digital Health Strategy are in place to support the digital health subsector, and My Health Record provides infrastructure for further digitisation across healthcare nationally. Australia's combination of highly remote areas and highly urbanised populations in city centres has accelerated the development of Australia's digital health industry and generated a tech-savvy and adaptive population. Digital health adoption will also be a core component of reducing Australia's emissions from the healthcare sector (for example, telehealth reduces emissions from unnecessary transport). Australia is also known for its regulatory frameworks that prioritise data safety and security. Building out the cyber security and data collection value of digital health products would enable Australia to meet the rising demand for public health data.

Digital health opportunities

Use of artificial intelligence, machine learning and other advanced technologies

Advanced use of artificial intelligence (AI), machine learning (ML), internet of things (IoT), quantum and other advanced technologies have the potential to transform patient care, supporting better health outcomes for Australians while lowering associated costs for practitioners.

For example, AI has shown the potential to enhance the efficiency of diagnostic tests. Digital tools can support clinicians with high-quality, trusted health intelligence that enhances personalised care (Killock 2020). AI and ML technology could be leveraged for digital medical records and the development of software solutions for automation and workflow optimisation. The use of quantum sensors can improve classical medical imaging approaches. Digital diagnostics, digital therapeutics and wearable technologies that incorporate advanced technologies also represent opportunities for added value through innovation.

Advanced software solutions

Developing a robust domestic software design ability – including in relation to patient management systems, medical device design and more – is crucial to ensure data security, mitigate cyber threats, and leverage Australia's reputation for robust regulation, making it an appealing exporter of healthcare technology.

Further, advanced software capabilities enable the creation of digital health solutions with a focus on user-centred design and would allow the industry to respond to emerging areas of demand more rapidly.

Cyber security and health data collection solutions

Recent high-profile cyber-attacks on domestic health researchers and insurers illustrate the importance of uplifting the security of patient and user data.

Australia’s whole-of-industry commitments to digital safety position it well to compete in global markets. Building out the cyber security and data collection value of digital health products would enable Australia to meet the rising demand for public health data.

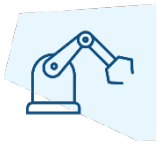
Medical devices

Australia can build on its research strengths in specialised fields – like personalised implants, bionics, monitoring devices, diagnostic devices, and wearable and nearable devices – by investing in high-value production activities.

Medical devices often have shorter development times than pharmaceuticals or biotechnologies, meaning returns can be realised sooner. Australian venture capital investments in medical devices have accelerated in the last 5 years, suggesting a growing maturity in this subsector (Medical Technology Association of Australia 2023).

There is a potential significant domestic market for medical devices. For example, over 70% of National Disability Insurance Scheme participants use some form of assistive technology (CSIRO 2022). This domestic market would help medical device SMEs establish a revenue stream and commercial experience before expanding into global markets. The Asia-Pacific medical devices market was valued at US$112 billion in 2023 and is projected to continue growing, presenting substantial opportunities for Australian businesses (APAC Medical Device Market 2023). Australia can leverage local demand for medical devices to build our sovereign capabilities, retain value in Australia, and seize emerging market opportunities in the Asia-Pacific region.

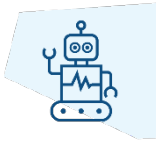
Medical device opportunities



Advanced manufacturing capabilities for specialty areas

Australia's medical devices industry is primed for transformation as investment grows and the industry matures. Investments in advanced manufacturing capabilities in specialised fields can leverage this growth to boost Australia's competitiveness.

The adoption of advanced manufacturing capabilities like additive manufacturing, robotics, microfabrication, advanced imaging and AI will help Australian industry meet the increasing demand for complex devices, including implants and bionics, medical diagnostics and personalised devices.



Robotics, including surgical robots, collaborative robotics and robotic intelligence

Investing in collaborative robotics and improving robotic intelligence across the medical science industry can reduce healthcare costs, improve patient outcomes, and deliver economic returns.

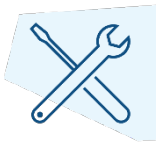
Examples are developing robotics expertise for clinical and technical applications and advancing the interaction between robots, the environment, and healthcare professionals. Australia's surgeons are known for their adoption of surgical robots and digital surgery, creating opportunities for growth and innovation domestically.

Non-invasive medical devices, including smart and connected medical devices

Australia can build upon the examples of our world-leading manufacturers of relatively non-invasive medical devices like Cochlear® and ResMed® to become a leading global player in the design, testing and manufacturing of smart and connected medical devices. Smart devices and non-invasive devices will experience increasing demand from an ageing population, increasing instances of chronic conditions, and the growing middle class in the Asia-Pacific region.

For example, Australia can leverage its research expertise in novel sensor technology to develop innovative non-invasive diagnostics for better detection, prevention and management of diseases (including automated management).

Support for the design and production of these high value products would allow Australian device businesses to seize emerging market opportunities and secure Australia's access to devices that can improve productivity and quality of life.



Production of therapeutic grade materials and componentry

Improving onshore capabilities would encourage local industry development. Australia can leverage its existing highly specialised contract manufacturing businesses to expand capability and diversify supply chains for high-value therapeutic-grade materials and components.

Complex therapeutics

Australia can leverage its research and manufacturing strengths in specialised fields to compete on high-value and advanced therapeutic products. For example, Australia is a world leader in several therapeutic research fields, including cardiology, oncology and gastroenterology. Australia is home to 4 of the world's 15 major biobanks and has leading expertise in fields including regenerative medicine, RNA technologies, and cell and gene therapy. These emerging fields present opportunities for Australia to carve out a market niche as the global pharmaceutical industry shifts to focus on higher value and more personalised therapies.

Australia's labour, input and transport costs mean that Australia is at a cost disadvantage relative to its international competitors for large-scale production (Productivity Commission 2021). Standing up new production capabilities for high-volume, low-value, small-molecule medicines in many cases will not be an economically viable option for enterprises operating in Australia. However, by focusing on high-value, innovative, complex therapeutics that have lower production volumes but can generate high revenues, Australia can strategically leverage its advantages in therapeutic research and precision manufacturing. This opportunity can be enhanced through investments in clinical trial capabilities, as keeping more phases of clinical development in Australia adds significant value and incentivises onshore production.

Complex therapeutics opportunities

Clinical trial infrastructure and capabilities

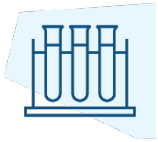
Australia is known globally for its streamlined, high-quality and trusted clinical trials ecosystem. Investing in expanded and more innovative clinical trial capabilities will help attract multinational investors and maintain Australia's leadership in complex and rapidly changing disease areas.

For example, the production of key clinical trial inputs like biological proteins and viral vectors will help keep clinical trials and innovative product development in Australia. Australia's clinical trial capabilities and capacity are a critical enabler for the long-term growth of the medical value chain.

Personalised medicines, particularly in RNA therapeutics, nucleic acid therapeutics, cell and gene therapies and regenerative medicines

The market for personalised medicines is expected to grow, with cell therapies and personalised treatments showing significant potential for multimillion-dollar growth. Australia has a strong value proposition in this sector, with expertise, high quality standards, and a strong innovation pipeline.

Investment in scaling up production capacity, securing onshore value chains, and developing starting materials is crucial to attract commercial manufacturing projects and support the growth of this industry.



Advanced research, development, and manufacturing

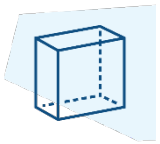
Facilities equipped with innovative technologies, such as high-throughput screening and molecular modelling capabilities, can increase the number of innovative products developed and commercialised in Australia. There are also opportunities to fill key gaps in the medical value chain, for example in pre-clinical testing capabilities. Access to innovative technologies will enable Australian businesses to seize emerging opportunities and realise first-mover advantages.

Sustainability

Sustainability is an increasingly important consideration for manufacturers, healthcare facilities and end users of medical products. The healthcare industry is responsible for around 7% of Australia's carbon emissions and generates large amounts of plastic waste, which is typically not recycled due to limited onshore recycling facilities, policies around the handling of clinical waste, and misclassification as biohazardous waste (Astell 2020). The Australian Government has committed to reaching net zero emissions by 2050 and has backed this commitment with supportive policies and funding mechanisms. Sustainable healthcare policies and programs are now in place for most states and territories (Wyns et al. 2022), but an aligned effort from medical manufacturers is needed to achieve a sustainable medical ecosystem. As industry transitions to net zero, there are opportunities to tackle sustainability challenges and add value by integrating innovations across the lifecycle of medical products.

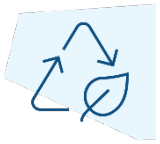
Investments in sustainable medical products and processes are needed to reduce waste, meet Australia's net zero commitments, and meet consumer demand for greener products. Australia can leverage its technological expertise in fields like materials science and its supportive policy environment to establish itself as a leader in greener medical manufacturing. Products with leading environmental, social and governance (ESG) credentials can attract a premium price and act as a key differentiator for consumers.

Sustainability opportunities



Additive manufacturing capabilities

There are diverse opportunities to leverage Australia's existing strengths and capabilities in additive manufacturing (often referred to as 3D printing) for designing and manufacturing biomedical technologies more sustainably. Additive manufacturing is a more cost effective and efficient way to produce quality prototypes or personalised devices while reducing waste, lowering emissions, and enhancing the circular economy.



Incorporating circular economy principles

Advancements in circularity in medical value chains will be essential for addressing ESG concerns over the long term. Australia has an opportunity to be a leader in medical science industry sustainability through investments in clinical recycling capabilities, reusable medical consumables, and innovative waste management.

Australia can leverage its strengths in materials science and engineering to develop innovative and value-adding solutions. For example:

- degradable clinical-grade materials for medical devices
- repairable medical devices
- biodegradable healthcare packaging
- benchtop sterilisation technologies
- co-locating recycling capabilities with healthcare facilities

- improved resource recovery systems
- repurposing scrap plastics.

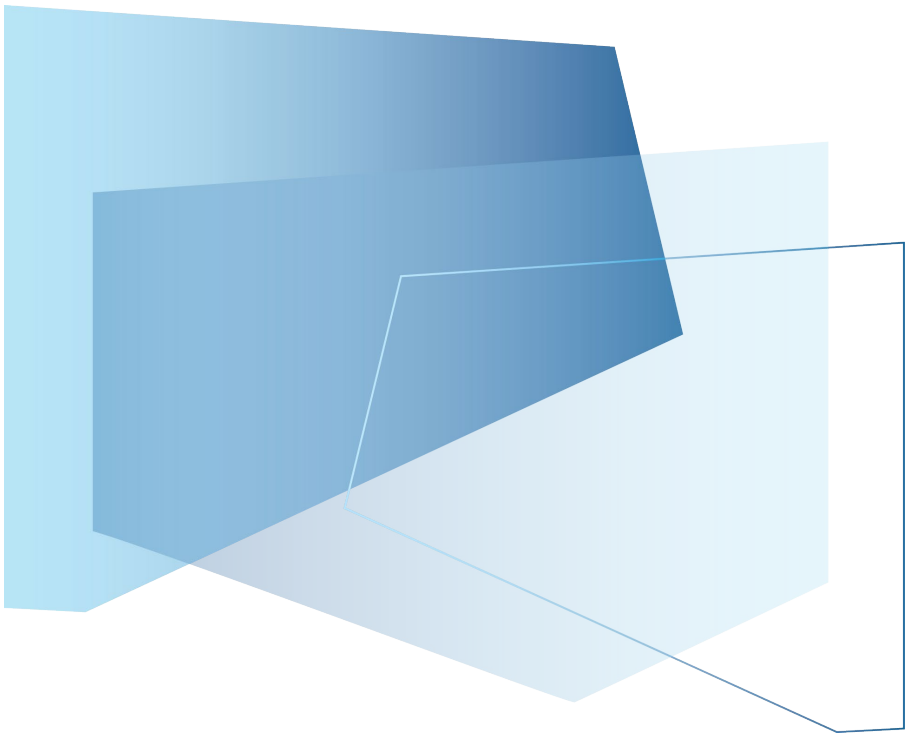
Incorporating circular economy principles also helps build resilience into material supply chains.

Preventative healthcare and sustainable production

Improving the environmental sustainability of medical production activities can help reduce costs and improve efficiencies. There are opportunities for:

- increased preventative care and connected diagnostics
- more sustainable engineering processes
- integration of renewable energy sources
- water and chemical waste management solutions
- greener input choices for medical production sites.

As Australia's medical science industry grows, there will also be opportunities in adjacent industries like cold chain storage and distribution and medical packaging, which present additional opportunities to carve out a competitive advantage through reduced waste and emissions and improved product longevity.



Advancing our capabilities

To continue to diversify and transform Australian manufacturing, government and industry need to work together to build a supportive manufacturing ecosystem. Capital investment alone cannot drive the growth of a sustainable manufacturing industry.

The plans identify 6 broad areas where potential further action by government and industry could bolster manufacturing growth and competitiveness across the priority areas. The 6 areas for potential further action are:

- Skills and capability availability
- Demand
- Collaboration and coordination
- Supply chain diversification
- Research translation and commercialisation
- Regulation and business settings

This section outlines potential further actions in the 6 areas to build a supportive manufacturing ecosystem for this priority area. Given common ecosystem needs in manufacturing, there are some overlaps in potential actions across the plans. The potential actions complement and build on existing initiatives (more information at *Appendix D*).

Taking action in medical science

Medical science has a unique operating environment, with specific barriers to industry growth. Targeted actions from industry and government are needed to tackle these barriers.

Theme 1: Skills and capability availability

Bringing a medical product to market is a complex process requiring specialist skills and experience. Industry has identified that shortages of people with deep skills and experience in commercialisation and reimbursement are a significant barrier to growth, particularly for SMEs. Australia's small medical science ecosystem means there are few people with the required end-to-end commercialisation experience, so talent must often be attracted from overseas. Industry-based skills, like expertise in setting up certified labs (NATA or ISO certified) and staff trained in designing and implementing GMP-compliant manufacturing processes are also in short supply amid a competitive global market. Skills in emerging technology areas like RNA, gene technology, in silico drug development and digital health will require a collaborative effort to attract and develop in Australia.

The government is committed to building a skilled and adaptable workforce, as outlined in the Employment White Paper. The government is taking comprehensive action to build a workforce fit for a future economy in Australia. This includes:

- improved education and regional planning systems
- reforms to key enablers like employment services, childcare and housing
- driving real wage growth and higher living standards through productivity growth
- addressing barriers to full and inclusive labour force participation.

In addition to building and upskilling our local workforce, the government's Migration Strategy will deliver a better targeted migration system focused on addressing key skills gaps to support Australia's ambitions.

Diversity and inclusion

Increasing diversity and inclusion in the workforce is critical to industrial transformation. Underrepresented groups are an untapped resource for capability development.

For example, women are currently 29% of the total manufacturing workforce, a proportion which has not meaningfully changed in the last 40 years (ABS 2023d). First Nations communities have traditional knowledge and practices in the medical field and some medical products are sourced from national forests and lands that are traditionally owned and managed by First Nations communities. Better collaboration and harnessing the skills and abilities of people from diverse backgrounds can create a strong and inclusive workforce able to seize the opportunities of the future.

The Australian Government is committed to improving workplace diversity and gender equality, including through implementing recommendations from the review of the *Workplace Gender Equality Act 2012* to further drive workplace gender equality in Australia. Closing the Gap is a key Australian Government priority and includes targets for employment and economic participation. The government has also committed to take actions identified by the Australian Universities Accord to support the higher education participation of First Nations people.

There are several existing initiatives helping to build a skilled and experienced medical workforce. For example, the ARC Industry Fellowships program supports researchers to develop cutting-edge innovations and apply their research to addressing industry challenges. The Industry Growth Program helps to provide commercialisation and growth advice to innovative SMEs.

Actions to build a skilled and experienced workforce that attracts international talent and supports mobility across the medical product value chain

- Support industry-based training programs and fellowships that build the industry-specific skills of Australia's medical science workforce.
- Connect start-ups and SMEs with specialist expertise in medical product translation and commercialisation to provide training and advisory services.
- Improve the diversity and inclusivity of the medical manufacturing workforce, with a focus on building diverse leadership and supporting First Nations participation.
- Connect the medical science industry with subject matter experts in recycling, re-use, and renewables to advise on sustainability solutions and improvements.

Theme 2: Demand

Australia's health procurement processes are complex and inefficient, limiting opportunities for Australian businesses seeking a pathway to market. Health procurement practices vary across jurisdictions and facilities, adding complexities and burdens for start-ups trying to navigate healthcare systems. Governments are often the main customers for medical products, so government procurement is a major lever for driving product demand and incentivising Australian production.

Global market access is essential for the commercial success of medical products, given Australia's small domestic market and the high costs of product development. While local procurement of Australian-made medical devices is an important initial step for global market access, Australian drug and device developers need to have a global perspective from the outset. This includes understanding market opportunities, international standards, and regulatory and reimbursement processes in their target overseas markets, as well as access to the support and partnerships needed to realise those opportunities.

The government is already acting to increase demand and procurement opportunities for locally made products to support industry growth though the Buy Australian Plan. Austrade plays a key role in promoting Australian trade and investment opportunities to the world and connecting businesses with global networks.

Actions to increase domestic demand and procurement opportunities for locally made medical products to support industry growth

- Strengthen ESG considerations in procurement practices, including sustainability and procurement for First Nations' businesses.
- Improve the transparency and accountability of health procurement processes.
- Identify opportunities to incentivise the trialling, purchasing and implementation of new Australian-made medical products.
- Explore opportunities for government (including states and territories) and industry to use purchasing power to grow domestic demand.

Theme 3: Collaboration and coordination

A thriving medical science industry relies on the ability to transfer skills and knowledge between research and industry, as well as a degree of coordination in where and how efforts are best focused. Currently, limited visibility of existing capabilities and potential benefits, as well as time and cost barriers, hold back industry-to-research and industry-to-industry collaboration, both within Australia and with key international partners. Greater collaboration between clinicians and innovators would build industry knowledge of clinician demand and competitive differentiation, allowing for a more coordinated focus on products that meet identified market demands and can find a purchaser. Improved coordination between government and industry would also improve Australia's ability to respond to crises and ensure its sovereign capability. In a highly globalised industry like medical science, strategic industry partnerships and collaborations, including with international partners, are central to the medical science industry's growth and global competitiveness.

Medical precincts like the Westmead Health Precinct and the Melbourne Biomedical Precinct play a key role in facilitating collaboration to drive commercial outcomes. By connecting key players and finding synergies through precincts, Australia's medical science industry can build critical mass. Precincts are also an effective way to attract investment and multinational partners by promoting Australia's strengths and capabilities by providing a variety of business and commercialisation support in one area. Effective collaboration governance within precincts and co-location of manufacturing capabilities with research and development activities can support more effective innovation and commercialisation and uplift capability building.

There are already several government programs to support increased collaboration between industry, research and government to unlock opportunities from innovation and growth and build a more coordinated national capability. These include the National Industry PhD Propgram and the National Collaborative Research Infrastructure Strategy (NCRIS), among many others.

However, government and industry could do more to build a collaborative medical ecosystem.

Actions to increase collaboration and coordination between industry, research and government to unlock opportunities from innovation and growth

- Facilitate collaboration between clinicians, healthcare providers, researchers and industry to support the development and commercialisation of healthcare innovation with an identified market demand.
- Support coordination and best-practice governance across medical precincts to build on inherent strengths, avoid infrastructure duplication and incentivise commercial outcomes.
- Ensure industry can participate in effective and meaningful consultation on health policies.
- Improve international awareness of Australia's medical industrial capabilities and seek opportunities for international collaborations.

Theme 4: Supply chain diversification

Strategic efforts to transform the medical science industry require an understanding of Australia's vulnerabilities, including supply chain risks. Medical input supply chains are less diversified than other sectors. Inputs are often highly specialised and often must meet strict medical quality control standards. Geopolitical tensions and global disruptions have led to a greater prioritisation of medical supply chain resilience and traceability from government and industry globally. Prior to the COVID-19 pandemic, there was little economic imperative to diversify suppliers, posing risks to both industry and patient health. The emergence of novel products and therapies also has implications for new reagent supply chains. Industry will need to ensure that it can keep pace with new innovations and maintain GMP-grade supplies.

Industry Innovation and Science Australia's report Barriers to collaboration and commercialisation identifies that some businesses face significant import competition and show low competitiveness while others mainly serve the domestic market and show a certain level of production capability. For those facing high import competition, the next phase of development is to increase their domestic capability. For those that already have a certain level of domestic capability the next phase of development is to increase their export activity.

The government works to secure essential medical supply chains by monitoring supplies of critical medical products through the Office of Supply Chain Resilience, and securing stocks of critical products via the Medicines Supply Security Guarantee.

Actions to ensure Australia's medical supply chains can meet the demands of future innovations and are resilient to disruption

- Improve the transparency and traceability of domestic and international medical supply chains.
- Support medical supply chains that are easily adapted when needed and that prioritise sustainability.

Theme 5: Research translation and commercialisation

Translating medical research in Australia faces additional barriers to securing funding due to the perceived high levels of risk and uncertainty about commercial returns, exacerbated by a comparatively small Australian medical manufacturing ecosystem. De-risking translational activities and incentivising later stages of clinical development in Australia can attract investors and support the growth of small businesses and start-ups.

The Australian Government has implemented several programs aimed at addressing this gap. For example, the Industry Growth Program provides advice and matched grant funding for commercialisation and growth projects in the priority areas. The government is also providing guidance through initiatives like the HERC IP Framework.

Actions to improve pathways to translate Australia's world leading medical research into innovative, high-value commercial products

- Support embedding translational facilities and expertise within healthcare settings and innovation precincts to support clinician-led innovation.
- Identify and address key capability and infrastructure gaps holding back medical translational activities, including options to support capability building in university technology transfer offices and improve accessibility to translational facilities.
- Support innovative medical manufacturing and commercialisation pathways that are sustainable and contribute to reducing greenhouse emissions and plastic waste.

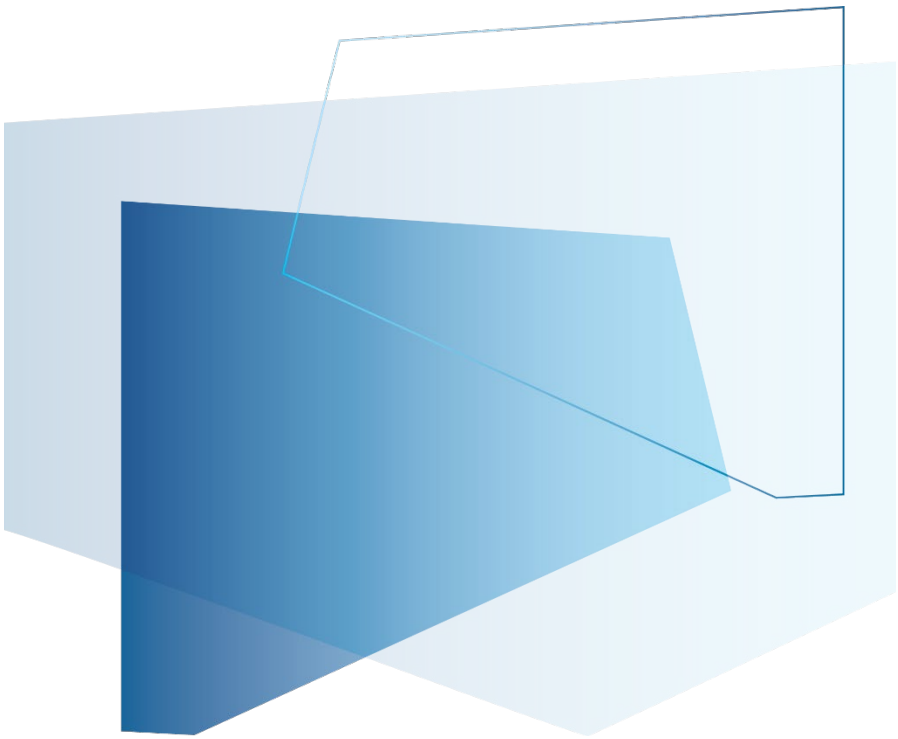
Theme 6: Regulation and business settings

One of Australia's strengths is the robust regulatory framework that promotes a strong global reputation for quality and safety. The TGA is a globally respected and trusted medical product regulator. However, industry stakeholders have noted barriers to competitiveness when it comes to the cost, time and ease of seeking regulatory approval and reimbursement. In an increasingly competitive global operating environment, Australia must ensure we have a regulatory system that promotes competition so that industries can grow.

The Australian Government is already working to streamline processes and improve Australia's ability to rapidly adopt innovations, including through the Health Technology Assessment and Policy and Methods Review and a commitment to modernise the My Health Record.

Actions to create an internationally competitive business environment supported by streamlined regulatory processes

- Continue to consider the impact of Australia's medical regulatory and reimbursement settings on industry competitiveness, particularly for emerging technologies and digital health.
- Identify opportunities to leverage the Medicare Benefits Scheme and the Pharmaceutical Benefits Scheme to support industry growth, including digitalisation in healthcare.
- Explore opportunities to support digital health capabilities including through measures to complement modernising My Health Record, and better connecting health data across the medical ecosystem such as national data sets and robust governance and legislative frameworks.
- Investigate ways to incentivise greater ESG reporting and net zero commitments from Australia's medical science industry.



Appendix A: Glossary

Term	Definition
Environmental, social and governance (ESG)	Stakeholder focused approach to business operations based on sustainability and ethical principles behind investment decisions.
Good Manufacturing Practice (GMP)	Good Manufacturing Practice (GMP) describes a set of principles and procedures that when followed helps ensure that therapeutic goods are of high quality. A basic tenet of GMP is that: • quality cannot be tested into a batch of product • quality must be built into each batch of product during all stages of the manufacturing process. There are different codes of GMP, depending on the type of therapeutic good.
Gross domestic product (GDP)	Monetary value of all goods and services bought and sold over a time.
Gross value added (GVA)	Monetary contribution of all goods and services, minus the cost of input and raw materials responsible for the goods and services.
Manufacturing	Manufacturing products includes: • developing products and • providing logistics relating to products and • distributing products and • producing products and • selling products and • providing after-market services relating to products and • maintaining products.
Medical science priority area	The area of the Australian economy that is involved in manufacturing products for therapeutic use.
National Reconstruction Fund Corporation (NRFC)	A $15 billion Specialist Investment Vehicle to crowd in finance to transform and diversify Australia's industry and economy and support the development of market-leading enterprises in the priority areas of the Australian economy.
Small and medium enterprise (SME)	A small enterprise is one with 19 or fewer employees, while medium enterprises have 199 or fewer.
Therapeutic use	Therapeutic use means use in or in connection with: • preventing, diagnosing, curing or alleviating a disease, ailment, defect or injury in persons or • influencing, inhibiting or modifying a physiological process in persons or • testing the susceptibility of persons to a disease or ailment or • influencing, controlling or preventing conception in persons or • testing for pregnancy in persons or • the replacement or modification of parts of the anatomy in persons.

Appendix B: Co-investment plan development approach

Co-investment plans have been developed by the Department of Industry, Science and Resources (DISR) in consultation across government, industry, peak bodies, academia and unions to advise on the financial and non-financial policy barriers to scale and innovation – and actions to tackle them.

A medical science industry working group was established to provide expert industry insights on prospective investment opportunities and barriers to growth and competitiveness. Industry working groups were made up of experts from peak bodies, relevant unions, technical experts, industry and relevant government departments.

In addition to industry working group insights, co-investment plan investment opportunities were informed by external economic and strategic analysis. Briefly, sub-sectors in each priority area were screened based on their projected demand, economic potential, maturity, investment landscape, risks and opportunities, and trade and regulatory settings. Subsectors were then assessed for potential investment opportunities, with consideration to key market trends and international market opportunities as relevant to the priority area.

In selecting investment opportunities, DISR also considered key national strategic objectives, like sovereign capability needs and net zero commitments.

Co-investment plans also leveraged insights from submissions made on the design of the NRFC. Submissions were open from 30 November 2022 to 2 February 2023. More than 250 submissions were received.

Input from the above sources, as well as research conducted by DISR and bilateral industry engagement beyond the industry working group have been used to inform the co-investment plans.

Scope and audience

These plans have been drafted as policy documents intended to provide information to the public on where the government sees aspirational opportunities that align with its broader vision for the seven priority areas. The information included within is intended to be demonstrative and broadly accessible, rather than specifically tailored as financial guidance for investors.

The scope of the plans includes:

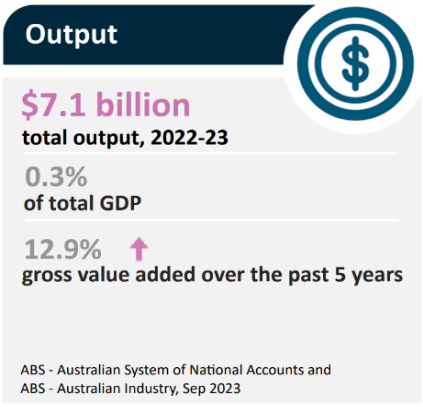
- identifying high-level investment opportunities that have been informed by industry and align with the broader goals and policy objectives of the government
- suggesting potential ways governments and industry may be able to support growth across the priority areas.

Those seeking to make investments in any of the identified areas should conduct their own due diligence to ensure they are appropriately informed as to the risks and potential returns of any such investment.

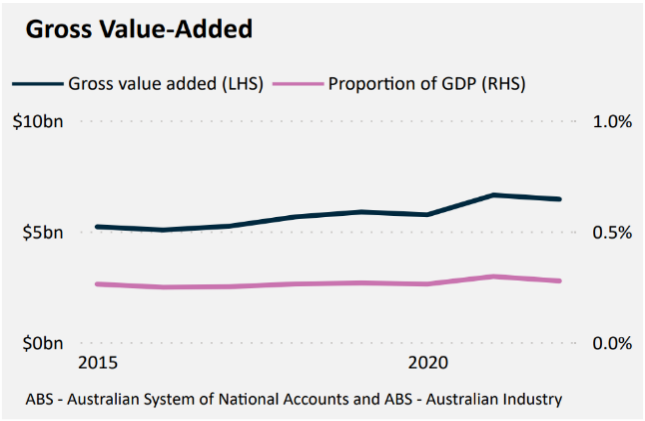
Some background information is provided within each plan relating to the priority area, including in respect to the current state of the industry in Australia and investment trends. Noting the breadth and depth of each subsector within the priority area, this information has been generalised to a degree to ensure the documents remain broadly accessible.

Appendix C: Medical science investment landscape

Investments in the medical science priority area have the potential for significant capital growth. Growing global demand for medical products is driving increased investor interest in the medical science industry (Australian Trade and Investment Commission 2022). For example, public and private R&D spending in medical science in Australia has grown at around 14% per annum over the last 5 years, and the value of capital raised by the sector grew four-fold from $496 million in 2016 to $1.7 billion in 2021 (MTPConnect 2022). Australian manufacturing in the medical science priority area has also seen growth. Despite its relatively small contribution to GDP, the priority area has increased its gross value addition to the economy by 12.9% over the past 5 years (ABS 2023a; ABS 2023b).



Output of the medical science priority area of the Australian economy.



Gross value-added of the medical science priority area of the Australian economy in the last 10 years

Global revenue and market share of medical products 2023

However, it is important to understand the unique nature of the sector. Medical science investments can be high risk due to lengthy development times, high costs, and commercialisation challenges (AusBiotech 2018; Marešová et al. 2020). The relatively low success rates of new products introduce risks and costs. For example, a 5% to 15% pharmaceutical commercialisation success rate (from phase I trials) means companies must also cover the costs of unsuccessful developments in their portfolio. This high failure rate is driven by issues with clinical efficacy or toxicity, production issues, lack of commercial demand and poor strategic planning (Sun et al. 2022).

Clinical trials, complex and highly regulated manufacturing procedures, and quality assurance processes drive expensive and sometimes decades-long development and commercialisation timelines. Consequently, many pre-revenue start-up companies derive most of their value through their IP assets. Revenue often relies on integration into healthcare systems, which varies across jurisdictions and requires complex tactical planning.

Given the time and challenges of successfully commercialising and scaling medical products, capital investments need to be patient and understanding of the sector's unique risks. Investors that can tolerate uncertainty and the sector's unique operating environment stand to benefit from substantial returns on investments, as well as promoting public good outcomes through new or improved therapeutic products or processes.

Investment characteristics across commercialisation lifecycle

Early development

The discovery stage of medical product development is typically funded by government and philanthropic organisations, with some established companies undertaking in-house early research. Public sector investments in medical science are concentrated at the early stages of development, as research grants are most appropriate for the exploratory and high-risk profile of projects at this phase.

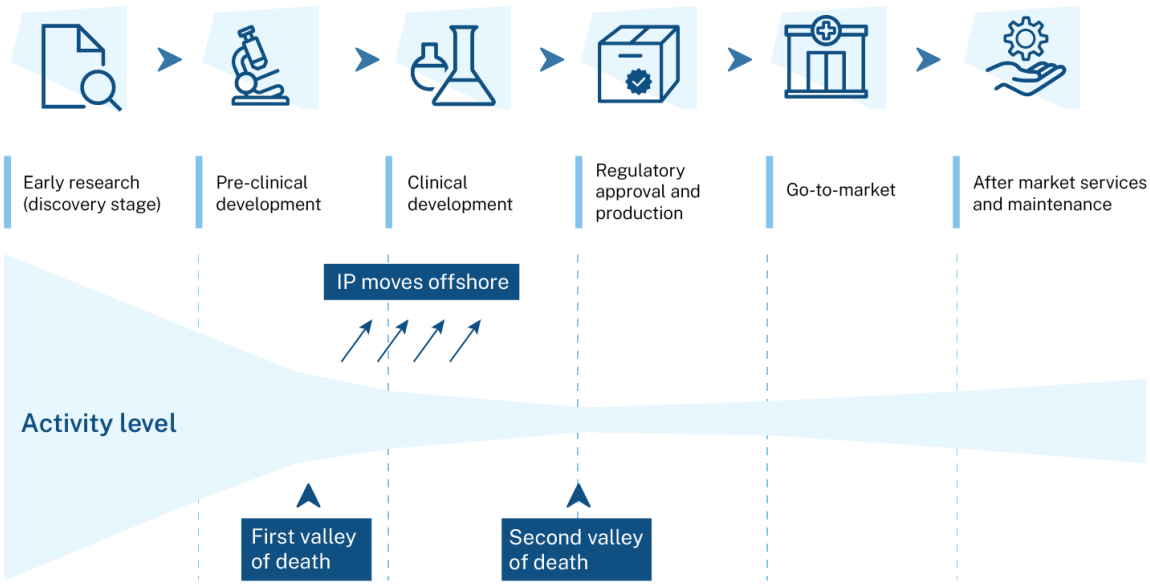
The Australian Government provides funding for early medical research and development through:

- higher education research grants
- grants for industry-led research
- funding for national research infrastructure
- institutes like the National Health and Medical Research Council (NHMRC) and the Australian Research Council (ARC).

Research translation

The research translation phase of product development is particularly challenging and is often referred to as the 'valley of death'. This is partly due to a funding gap at this stage, as there are still high levels of risk and uncertainty about commercial returns which limits substantial funding from private investors.

Private funding at this stage could come from angel investors, crowd sourcing and philanthropy. However, these sources of capital are underdeveloped in Australia compared to other advanced economies. Australia has a small number of large venture capital (VC) firms with the depth of funding and experience needed for patient medical investments. Pre-revenue SMEs that cannot provide a sustainable history of revenue or collateral struggle to secure loans and face additional challenges securing capital in an already limited and inexperienced private investment ecosystem. Consequently, SMEs can be driven to prematurely list on the ASX, out-licence their IP or move their operations offshore.



Medical product development lifecycle

The government recognises funding challenges at this stage of development and supports research translation and commercialisation through several initiatives, including the Industry Growth Program, the Medical Research Future Fund, CRC Programs, and several CSIRO programs. There are also several

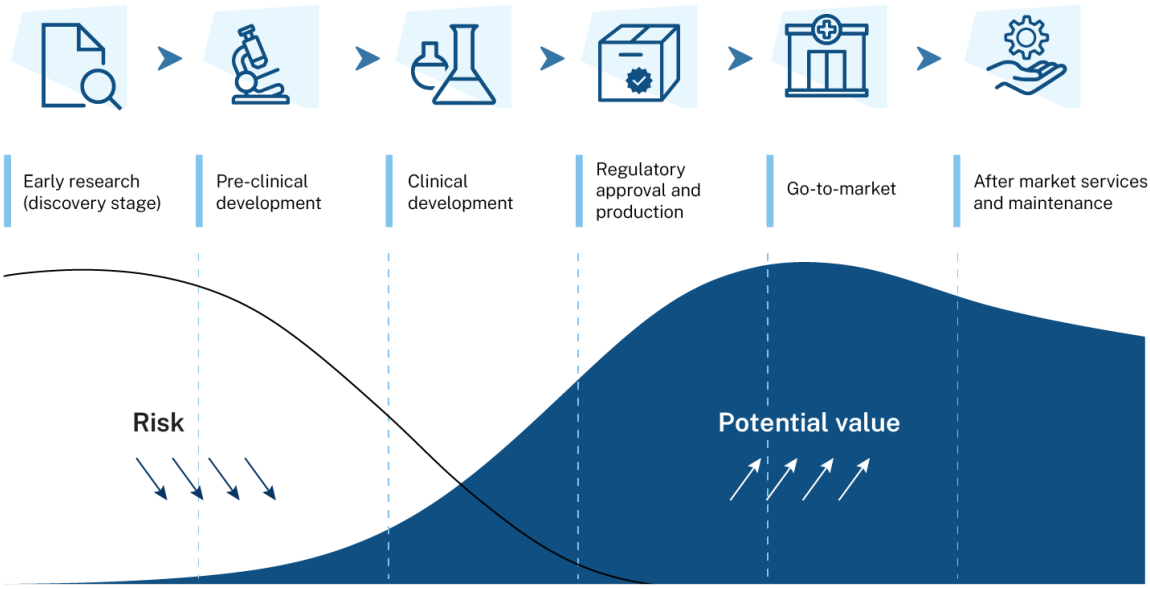
state-based programs aimed at commercialising medical research, such as New South Wales's Medical Devices Fund, Queensland's Industry Partnership Program and Victoria's Medical Research Acceleration Fund. The Research and Development Tax Incentive is another significant way for companies to lower the cost of innovation, providing a tax offset for eligible R&D activities as part of the research commercialisation process.

Despite these programs, industry stakeholders report that funding for early-stage commercialisation activities in Australia is challenging without a more sustainable and systemic approach. Support from institutions or partners that can help de-risk this stage or provide critical infrastructure or expertise can be difficult to access given the industry's small size. Some universities lack a nuanced entrepreneurial culture and commercialisation experience, contributing to the scarcity of capital and commercialisation capabilities at this stage. Additional investments may assist in de-risking the environment, increasing attractiveness for private industry to license or buy university IP and take it through to commercial success. Further action on ensuring that government supports are well coordinated to avoid duplication can help ensure the effective use of public funds.

Much of Australia's intellectual property, particularly for pharmaceuticals and biotechnologies, moves offshore before phase I and II trials. Consequently, Australia loses significant value from these activities, as well as opportunities for capability development. Once intellectual property moves offshore, it is difficult to bring it back to Australia for production at scale. A highly capable clinical trials sector is therefore essential to growing Australia's medical manufacturing capabilities and keeping value onshore for longer. Further, improving the cost competitiveness of clinical trials and associated production activities can increase Australia's investment attractiveness.

Clinical trials to commercialisation

Once products have moved beyond phase II clinical trials, their investment risk is lower, and strategic industry partners or investors are more willing to commit appropriate capital. However, industry stakeholders have indicated that Australia's private capital markets are underdeveloped. There is limited risk tolerant, patient, and experienced capital for projects at the later stages of clinical development and commercialisation. Australia's venture capital landscape is not as deep compared to other advanced economies, and many venture capitalists lack the specialist skills and experience to understand emerging technologies and the competitive marketplace for new medical products. Investment from local industry partners is also constrained by Australia's comparatively small medical product ecosystem. This funding gap has led to this stage being dubbed a second 'valley of death', as product development often stalls or moves offshore at this stage.



Pathway from clinical trials to commercialisation

Attracting capital investments from multinational partners can also be challenging due to Australia's geographical isolation, the low global visibility of Australia's research strengths and perceptions that Australian innovations are less 'investment ready'. Medical technology and digital technology multinationals typically want to see evidence of local market success for medical technologies before investing, making local procurement a key milestone for growth. Alternatively, pharmaceutical multinationals tend to partner with smaller local companies earlier to diversify their R&D pipelines before licensing the intellectual property for offshore production. Where industry partners and capital investments are sourced from outside Australia, there can be added pressure for companies to move their operations offshore. Incentivising international investment will be integral for uplifting Australia's medical industrial capabilities.

Production and scaling

It has been broadly noted that Australian industry structure is dominated by small businesses (91.1% of all medical science businesses have 19 staff or less), with a 'missing middle' of medium-sized businesses (Industry Innovation and Science Australia 2023). This means that the scaling of innovation and realisation of commercial benefits often either fails or is taken offshore. Specific barriers are also present in the medical science industry that make scaling challenging. Companies scaling or maintaining production activities in Australia can face financial challenges from high and fluctuating project costs. Medical manufacturing processes often require specialised materials and facilities which can be expensive to acquire, maintain and operate in accordance with regulatory requirements. Due to the specialised nature of materials and equipment, supply chain disruptions can expose manufacturers to unavoidable price inflation. Historical underinvestment in supply chain logistics has left the cost of medical manufacturing projects vulnerable to global shocks (University of Melbourne 2020). Australia's ability to be cost-competitive and resilient in medical production through productivity improvements will be crucial for industry growth.

Given Australia's relatively small population, access to regional and global market export volumes have traditionally been needed to ensure Australian production sites can scale and become commercially sustainable. International relationships and awareness of how to penetrate new markets are core to such successful scaling, and effective planning for this stage of development should be built in at the earliest stages of development. This includes consideration of how value can be added through post-market services. Technological advancements may make it more commercially viable for emerging companies to manufacture innovative, high-quality and high-value products domestically. Though international scaling may still be necessary under such business models, competition will focus more heavily on the ability to deliver quality products that meet customer needs than on providing bulk quantities at lower prices.

Biologic products, such as biosimilar medicines, have specific TGA comparability requirements. Investment in manufacturing to enable production of biosimilar medicines from specific Australian-based facilities may be an opportunity for investment.

Appendix D: Background on related Australian Government initiatives

The National Reconstruction Fund Corporation

The National Reconstruction Fund Corporation (NRFC) is a $15 billion Australian Government commitment which will facilitate increased flows of finance into government-identified priority areas of the Australian economy, through targeted investments to diversify and transform Australian industry, create secure, well-paying jobs and boost sovereign capability.

The NRFC will provide finance (debt and equity, but not grants) in 7 government-identified priority areas:

- value-add in resources
- value-add in agriculture, forestry and fisheries
- medical science
- renewables and low emission technologies
- transport
- defence capability
- enabling capabilities

The NRFC is governed by an independent board, operating in accordance with its legislative framework, including an Investment Mandate. The Investment Mandate sets out clear expectations from the Australian Government, including industry sectors for investment allocation, expected outcomes, collaboration and cooperation with other government entities and benchmark return. The NRFC will operate in a commercial manner to transform and diversify Australia's industry and economy. The NRFC will also contribute to achieving other whole-of-government priorities.

Industry Growth Program

To deliver the government's commitment to rebuild Australia's industrial capability in priority areas of the Australian economy, the government has established the Industry Growth Program.

Innovative SMEs and start-ups play a crucial role in the Australian economy, introducing new products and services and creating jobs. The early stages of commercialisation and growth can be high risk and high cost, resulting in significant challenges for many SMEs. The $392.4 million Industry Growth Program supports SMEs and start-ups to get their innovative ideas off the ground and grow their businesses.

The program provides advice and matched grant funding for commercialisation and growth projects in the priority areas.

Achieving Net Zero

Australia is committed to taking action on climate change and has legislated to reduce greenhouse gas emissions by 43% below 2005 levels by 2030 and to reach net zero emissions by 2050. Australia is among the countries best positioned to benefit from this transformation, through converting its natural advantages into broad opportunities across industries that drive sustainable growth. Australia has enormous potential as an advanced manufacturing nation, one that plays a critical role in the future global green economy while adding value to exports and growing domestic manufacturing. A focus on sustainability and adoption of circular economy principles is also critical to transforming Australian industry to meet the challenges and opportunities of the future.

All levels of government and industry play a role in reducing greenhouse gas emissions, and transforming how we manufacture products in Australia can significantly help to reach net zero. The government has

several existing initiatives to ensure industry is supported as we transition to net zero. The co-investment plans have been designed with reducing greenhouse emissions in mind.

Existing measures complementing NRFC investments in the medical science priority area

The Australian Government has a suite of existing policy and program levers that can support the medical science priority area. Other initiatives include but are not limited to the following:

- The ARC Linkage program aims to encourage and extend cooperative approaches to research and improve research outcomes by strengthening links with the innovation system. The program promotes partnerships between researchers and business, industry, community organisations and other publicly funded research agencies.
- Austrade is the government's lead trade and investment facilitation agency. It supports the medical science priority area by developing commercial partnerships to connect Australia with trade partners and target markets.
- The research translation and commercialisation agenda (such as the $1.6 billion Australia's Economic Accelerator Program (AEA)) supports research commercialisation and translation objectives.
- The Australian Industry Participation policy and the *Australian Jobs Act 2013* are two mechanisms that the help encouraged to maximise Australian industry participation in investment projects by providing industry full, fair and reasonable opportunity to participate.
- The Business Research and Innovation Initiative is a challenge-based innovation program. It provides startups and small and medium enterprises with grant funding to develop innovative solutions for government policy and service delivery challenges. Australian Government agencies support the program to develop new-to-market technologies that they can negotiate to buy.
- The government is already acting to increase demand and procurement opportunities for locally manufactured products, including those produced by the medical science industry, to support growth though the Buy Australian Plan.
- CSIRO is one of the largest R&D groups in the world, delivering innovation that solves the challenging, complex problems faced by medical science companies, government and other industry stakeholders.
    - The CSIRO Missions are large-scale, impact focussed scientific and collaborative research initiatives aimed at making significant breakthroughs against UN Sustainable Development Goals, national policy, and the national science priorities. The mission within the medical science sector is Minimising Antimicrobial Resistance.
    - Main Sequence (MS) was founded by CSIRO to bridge the valley of death between research and commercialisation. The priority areas of the NRFC are well aligned with investment challenges of MS. The Australian Government's research translation and commercialisation agenda has provided $150 million to expand MS.
    - The ON Program helps publicly funded researchers and SMEs develop skills to fast track their ideas to market.
- The $40 million Global Science and Technology Diplomacy Fund supports international science and research collaboration to advance Australia's science capability by partnering with strategic international partners.
- The establishment of Jobs and Skills Australia to help tackle skill shortages and plan for the workforce of the future.

- The Medical Research Future Fund is a $20 billion long-term investment to support Australian health and medical research. The program focuses on 4 key themes: patients, researchers, research missions and research translation.
- National Health and Medical Research Council's Medical Research Endowment Account invests in health and medical research.
- The National Skills Agreement is a 5-year joint agreement between the Commonwealth, states and territories to strengthen the vocational education and training sector. Advanced manufacturing is a key national priority for the National Skills Agreement. The Agreement will:
  - deliver a national VET system that provides high quality, responsive and accessible education and training to boost productivity
  - support Australians to obtain the skills and capabilities they need to obtain well-paid, secure jobs
  - ensure Australia has the skilled workforce it needs now and into the future, with TAFE at the heart of the VET sector.
- The development of a National Skills Passport, making it easier for employees to demonstrate their skills, change jobs and upskill.
- The Office of Supply Chain Resilience provides advice to the Australian Government on supply chain risks and the management of essential supply chains, providing national security advice and facilitating international partnerships with industry and global partners.
- The R&D Tax Incentive aims to support research and design initiatives within the sector.

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