



Science and Research Priorities

The Government has established a set of Science and Research Priorities, and corresponding Practical Research Challenges, designed to increase investment in areas of immediate and critical importance to Australia and its place in the world.

Australia depends on science and research to increase productivity, achieve sustainable economic growth, create jobs, and improve national well-being. Australian science also contributes to the global stock of knowledge across a broad range of areas.

Like other countries our capacity to support research is finite. With diverse investments in research across multiple agencies and many processes, we must ensure that we build our capacity to pursue research of particular importance to us as a nation.

Led by the Chief Scientist, Professor Ian Chubb AC, the Priorities and associated Practical Challenges were developed in consultation with researchers, industry leaders and government representatives.

In its recent meeting, the Commonwealth Science Council considered the Priorities and recommended that they be adopted by the Government immediately.

The Science and Research Priorities and associated Practical Challenges will ensure that appropriate levels of public funding are

research to the exclusion of other forms of research. Even in the priority areas, a significant amount of the research will need to be early-stage, basic research.

Addressing the Priorities and Practical Research Challenges will require effort from across the full spectrum of research disciplines, including the physical and life sciences, engineering, information and communications technology and the humanities and social sciences. It will also require a coordinated approach from all Government departments and agencies.

Cross-cutting issues related to the priorities present challenges in their own right and will be addressed through a whole-of-government strategic approach. These include big data, research infrastructure, workforce and international collaboration.

The Science and Research Priorities and Practical Research Challenges will be reviewed every two years to allow for new initiatives to take effect and to ensure that issues being addressed are still the most pressing for the nation.

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Our [Industry Innovation and Competitiveness Agenda](#) states that we will align Australia's research priorities with our comparative advantages and our [Boosting the commercial returns from research](#) paper calls for national science and research priorities and corresponding practical challenges.

allocated to research that addresses the most immediate problems facing the nation. They are neither exclusive; nor are they exhaustive.

The implementation of priorities is expected, over time, to result in an increased proportion of Australian Government research investment allocated on a strategic basis to areas critical need and national importance. This does not mean that funding should be directed to applied, mission-based

1. Food

Australian research and ingenuity has led to well-developed agricultural and fishery industries that contribute nutritious food to domestic and global markets. If Australia is to respond to increasing global demand for both plant and animal-based food, we will need to develop internationally competitive, sustainable, profitable, high intensity and high production capacity in new and existing food products, and in new and existing regions of Australia. We will face constrained soil and water resources, shifts in climate, and changes in the environment, and the emergence of new pests and invasive species, that could lead to increased difficulties in meeting expectations.

Research will aim to optimise food and fibre production and processing, enhance food safety and minimise waste. Research will also be critical to preserve our hard won reputation for clean, safe and sustainable production.

Departments and agencies should give priority to research that will lead to:

1. knowledge of global and domestic demand, supply chains and the identification of country specific preferences for food Australia can produce.
2. knowledge of the social, economic and other barriers to achieving access to healthy Australian foods.
3. enhanced food production through:
 - novel technologies, such as sensors, robotics, real-time data systems and traceability, all integrated into the full production chain.
 - better management and use of waste and water; increased food quality, safety, stability and shelf life.
 - protection of food sources through enhanced biosecurity.
 - genetic composition of food sources appropriate for present and emerging Australian conditions.

2. Soil and Water

Australia's soil, vegetation, biodiversity and water along with its marine resources are national strategic assets that should be highly valued and effectively managed. These assets are fundamentally interconnected components of our ecosystems, but the ways they interact and respond to change remain poorly understood.

Research should therefore focus on critical assets such as the Great Barrier Reef, Northern Australia, key agricultural regions, aquifers and urban catchments, and build capacity for improved accuracy and precision in predicting change. Research will lead to better decision-making strategies in the context of potentially conflicting demands between development, the environment and landscape management.

Departments and agencies should give priority to research that will lead to:

1. new and integrated national observing systems, technologies and modelling frameworks across the soil-atmosphere-water-marine systems.
2. better understanding of sustainable limits for productive use of soil, freshwater, river flows and water rights, terrestrial and marine ecosystems.
3. minimising damage to, and developing solutions for restoration and remediation of, soil, fresh and potable water, urban catchments and marine systems.

3. Transport

As the world increasingly diversifies its energy sources new markets are emerging for alternative fuels. Australia has the potential to develop new industries and to contribute to improved fuel security and to support the design and delivery of infrastructure that responds to Australia's urban, regional and remote communities, and changing demographics.

Research will be critical to developing low cost, reliable, resilient and efficient transport systems that meet the needs of businesses and enable sustainable mobility, while lowering carbon emissions and other pollution.

Departments and agencies should give priority to research that will lead to:

1. low emission fuels and technologies for domestic and global markets.
2. improved logistics, modelling and regulation: urban design, autonomous vehicles, electrified transport, sensor technologies, real time data and spatial analysis.
3. effective pricing, operation, and resource allocation.

4. Cybersecurity

Australia's cyber infrastructure underpins the entire knowledge economy, including government, business, defence, police, and emergency services. But our cyber infrastructure is vulnerable to exploitation by malicious actors and is subject to damage caused by non-malicious events such as natural disasters, equipment failure, human error and other accidents. It is essential that the security and resilience of this key infrastructure is assured.

Research in cyber security including quantum technologies will position Australia as a leader in fast moving and emerging areas such as distributed network management, machine learning, and intelligent and secure data management and retention.

Departments and agencies should give priority to research that will lead to:

1. highly-secure and resilient communications and data acquisition, storage, retention and analysis for government, defence, business, transport systems, emergency and health services.
2. secure, trustworthy and fault-tolerant technologies for software applications, mobile devices, cloud computing and critical infrastructure.
3. new technologies and approaches to support the nation's cybersecurity: discovery and understanding of vulnerabilities, threats and their impacts, enabling improved risk-based decision making, resilience and effective responses to cyber intrusions and attacks.
4. understanding the scale of the cyber security challenge for Australia, including the social factors informing individual, organisational, and national attitudes towards cyber security.

5. Energy

Australia has abundant energy resources, but we need to improve efficiency of use, reduce emissions and to integrate energy from any source into the electricity grid.

A desirable energy future is one with a diversity of sources and suppliers that progressively reduces carbon emissions and that is economically attractive for consumers and other stakeholders.

Research will lead to the development of reliable, low-cost, sustainable energy supplies that are resilient to sudden shocks, as well as decadal trends in demand and climate, and to technologies that use energy more efficiently.

Departments and agencies should give priority to research that will lead to:

1. low emission energy production from fossil fuels and other sources.
2. new clean energy sources and storage technologies that are efficient, cost-effective and reliable.
3. Australian electricity grids that can readily integrate and more efficiently transmit energy from all sources including low- and zero-carbon sources.

6. Resources

Australia's resource sector is a significant contributor to the economy. By prioritising the sustainable extraction of our resources and by adding value where we have competitive advantage, we will optimise long-term economic, social and environmental benefit to the community.

Research will lead to a fundamental understanding of the structure, composition, and processes governing the formation and distribution of resources in Australia. This knowledge will support the exploration, the potential discovery of major new sources, production, distribution of the traditional resources such as strategic metals and minerals, coal and gas and those in increasing demand such as rare earth elements and groundwater.

Departments and agencies should give priority to research that will lead to:

1. a fundamental understanding of the physical state of the Australian crust, its resource endowment and recovery.
2. knowledge of environmental issues associated with resource extraction.
3. lowering the risk to sedimentary basins and marine environments due to resource extraction.
4. technologies to optimise yield through effective and efficient resource extraction, processing and waste management.

7. Advanced manufacturing

Australian competitiveness needs innovative industries that are focused, agile, high value-add, transformative and fully integrated into global supply chains. In the competitive global market Australia should aim to dominate in selected product categories, where we have particular advantage.

Research will be critical in developing and supporting existing industries while enabling the development of a new and advanced manufacturing sector.

Departments and agencies should give priority to research that will lead to:

1. knowledge of Australia's comparative advantages, constraints and capacity to meet current and emerging global and domestic demand.
2. cross-cutting technologies that will de-risk, scale up, and add value to Australian manufactured products.
3. specialised, high value-add areas such as high-performance materials, composites, alloys and polymers.

8. Environmental Change

There are many factors that influence the environment. They range from global climate change to the environmental consequences of local actions; all are significant. These factors affect terrestrial, marine, rural and urban systems in Australia and within our region. While continuing to study environmental and climate science in Australia, and connecting to global research, we must learn to mitigate and adapt to local and regional effects.

Research will build Australia's capacity to respond to environmental change. It will require the integration of research outcomes from biological, physical, social and economic systems.

Departments and agencies should give priority to research that will lead to:

1. improved accuracy and precision in predicting and measuring the impact of environmental changes caused by climate and local factors.
2. resilient urban, rural and regional infrastructure.
3. options for responding and adapting to the impacts of environmental change on biological systems, urban and rural communities and industry.

9. Health

Australia's health needs must be addressed at both the individual and population level, and must recognise that health or "wellness" is not simply the absence of disease or infirmity. Good health requires the development of treatments, solutions and preventative strategies to improve physical and mental well-being.

Research will be essential to building healthy and resilient communities throughout Australia. It will capitalise on Australia's strengths in science and technology to generate wider economic benefits through improved knowledge translation and commercialisation, and partnerships with industry.

Departments and agencies should give priority to research that will lead to:

1. better models of health care and services that improve outcomes, reduce disparities for disadvantaged and vulnerable groups, increase efficiency and provide greater value for a given expenditure.
2. improved prediction, identification, tracking, prevention and management of emerging local and regional health threats.
3. better health outcomes for Indigenous people, with strategies for both urban and regional communities.
4. effective technologies for individuals to manage their own health care, for example, using mobile apps, remote monitoring and online access to therapies.