

**FEDERATION OF AUSTRALIAN SCIENTIFIC  
AND TECHNOLOGICAL SOCIETIES**

*Science and Technology for the Social, Environmental and Economic Benefit of Australia*

# A 21<sup>st</sup> Century Role for Australian Science and Innovation

2006 edition

## Glossary of acronyms

ABS	Australian Bureau of Statistics
AIMS	Australian Institute of Marine Science
ANSTO	Australian Nuclear Science and Technology Organisation
ARC	Australian Research Council
BERD	Business Expenditure on Research and Development
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEST	Department of Education, Science and Training
GA	Geoscience Australia
GDP	Gross Domestic Product
HECS	Higher Education Contribution Scheme
IDP	International Development Programme
NH&MRC	National Health and Medical Research Council
OECD	Organisation for Economic Cooperation and Development
PMSEIC	Prime Minister's Science, Engineering and Innovation Council
R&D	Research and Development

In this document, science includes all fields in science, mathematics and technology.

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The policies in this document are available in more detail at [www.fast.org](http://www.fast.org)

# **FASTS Vision for Australia in the 21<sup>st</sup> Century**

A nation:

- *educated to provide a high level of scientific understanding;*
- *using terrestrial and aquatic environments responsibly within scientifically established limits, and ameliorating past degradation;*
- *limiting our greenhouse gas emissions to meet our global responsibilities;*
- *providing healthy lives and a long, high quality, life expectancy for all Australians;*
- *generating wealth from innovation in all industries by producing value-added products and services that are both globally competitive and sustainable; and*
- *highly networked with an efficient regional transport system and national and international access to high quality telecommunications.*

## **FASTS Mission**

FASTS will be the leading advocate for policies to achieve this vision for Australia in the 21<sup>st</sup> Century.

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## A 21<sup>st</sup> Century Role for Australian Science and Innovation

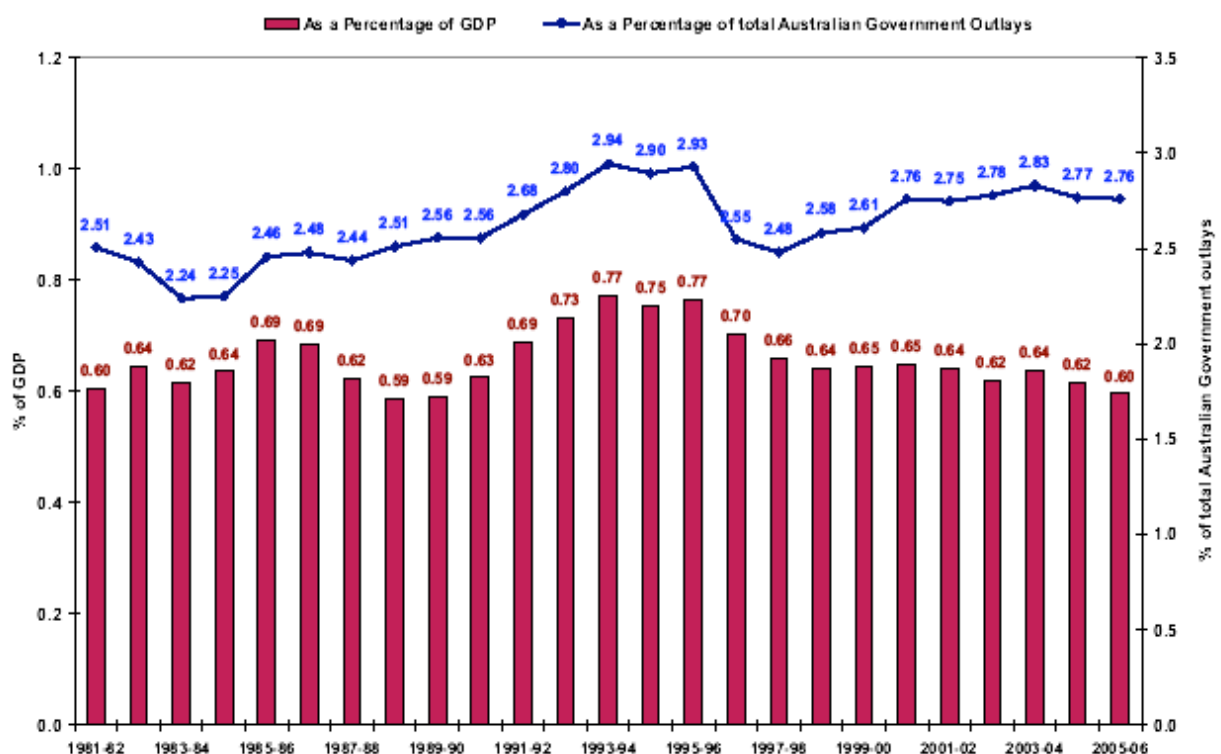
FASTS' vision for Australia, and its mission as the leading advocate for this vision, is directed by the principles and policy statements outlined in this document. FASTS believes that a robust and productive science and innovation system is a necessary condition for the nation's future prosperity. This requires understanding and action from Government, the private sector, and the science community.

What FASTS looks for from **Government** is that they allocate sufficient resources to:

- provide long-term capability building and 'preparedness R&D'<sup>1</sup> to make sure that our grandchildren, and their descendants, will enjoy the benefits of these investments;
- take a lead in identifying the social, environmental and security issues that require science and innovation for their solution, in a timely fashion; and
- set strategic long-term economic and industry policies to enable private and public sectors to plan and implement their roles.

Figure 1 indicates that in recent years the Australian Government has reduced its expenditure on science and innovation expressed as a percentage of GDP, and only just maintained it when expressed as a percentage of government expenditure. Currently our international competitors are strongly committed to greatly expanding their investment in science and innovation as a percentage of GDP. This does not augur well for our future competitiveness.

**Figure 1: Australian Government support for science and innovation as a percentage of GDP and share of Commonwealth outlays**



Source: DEST (2005) *Australian Science and Innovation System: A Statistical Snapshot*, Table 2.1.3, DEST, Canberra

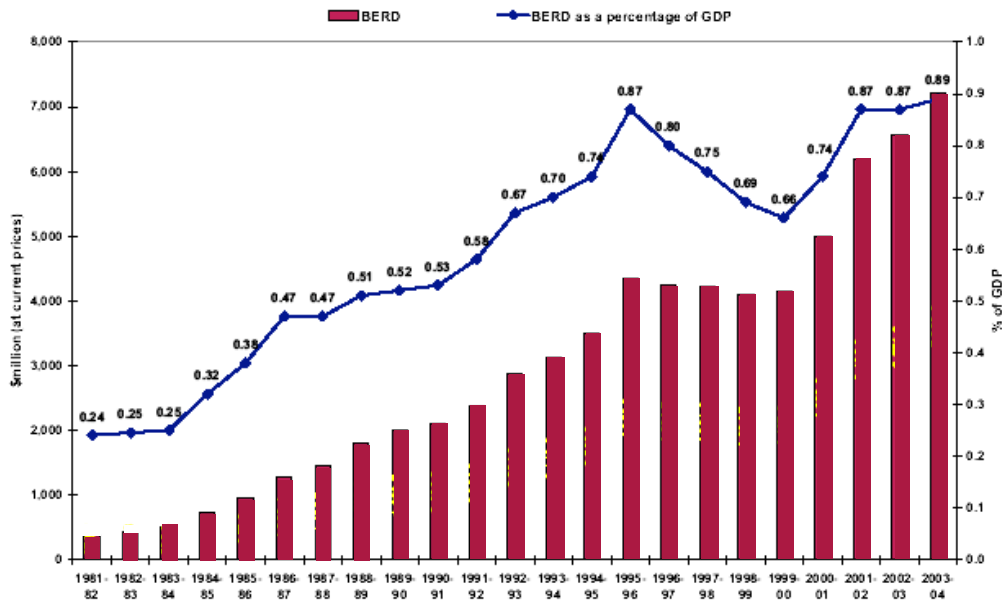
<sup>1</sup> Matthews, M. L. (2006) *Managing Uncertainty and Risk In Science, Innovation and Preparedness: Why Public Policy Should Pay More Attention To Geopolitical and Financial Considerations*. Policy Discussion Paper prepared by Howard Partners. Canberra: Federation of Australian Scientific and Technological Societies.

What FASTS looks for from the **private sector** is that it:

- interacts constructively with Governments and the science community for sustainable development;
- works closely with the education sector to ensure an adequate supply of skilled people; and
- takes a long-term view of its own science, R&D and innovation needs, and invests in building scientific and technological capacity to contribute to a strong economy.

We note from Figure 2 that the private sector in Australia is indeed increasing its expenditure on science and innovation to regain its position following a period of significant decline.

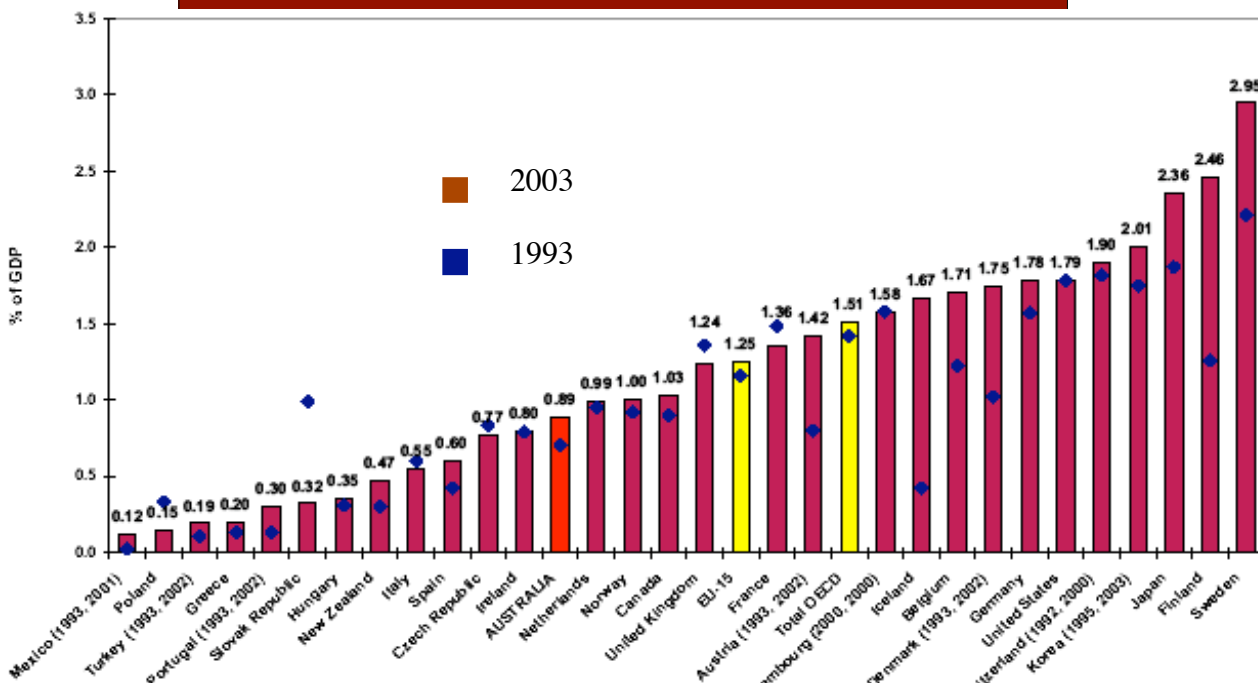
**Figure 2: BERD at current prices and as a percentage of GDP, 1981-82 to 2003-04**



Source: DEST (2005) Australian Science and Innovation System: A Statistical Snapshot, Table 3.2.2, DEST, Canberra

However, Figure 3 also shows that BERD is still considerably below the average of OECD countries. While this may be in part due to the structure of the Australian economy, this should not be used as an excuse for inaction by industry to invest more in R&D.

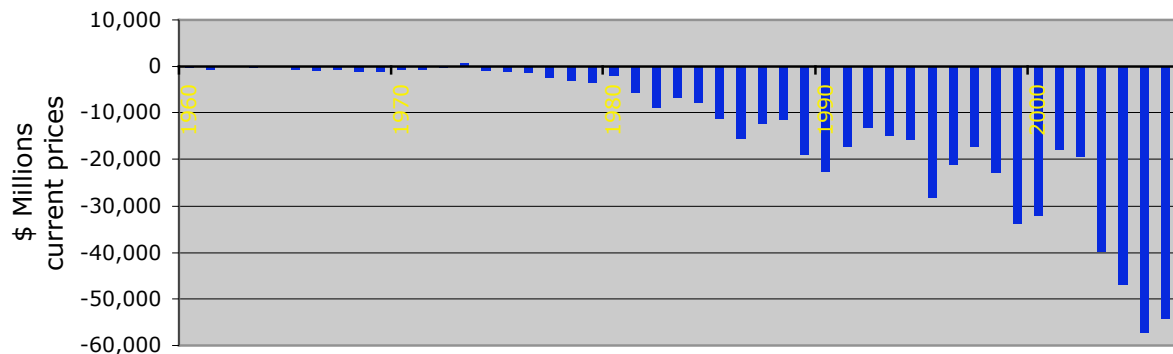
**Figure 3: BERD as a percentage of GDP - by OECD country, 1993 to 2003**



Source: DEST (2005) Australian Science and Innovation System: A Statistical Snapshot, Table 3.2.14, DEST, Canberra

A key concern for FASTS is that in a period where both our terms of trade and commodity prices are at a thirty year high <sup>2</sup>, our current account deficit has been deteriorating for a generation (Figure 4). Furthermore, higher education exports – the seventh largest foreign currency earner and third largest services export <sup>3</sup> – is under threat from a rapid expansion of capacity in Asia, and may be unsustainable in the long term. Science and technology have a crucial role in addressing both our structural and trade imbalances by building human capacity to innovate, minimise risk and create new products and processes.

Figure 4: Annual Current Account Deficits 1960-2006



Source: ABS Table 5302051 Balance of Payments.

What FASTS looks for from **our own science community** is we:

- articulate excitement about science and its applications to ensure an intergenerational interest in the relevance of science to every-day living, and in careers in science;
- engage with Governments, the private sector and the wider community to understand their needs; and
- maintain high standards of ethics and excellence in science.

A major concern is that there has been a decline in the number of people joining professional scientific societies, which will reduce the capacity of the scientific community to perform these functions.

In the longer term there is serious concern about the impending shortfall of scientifically trained people to meet Australia's future development needs. DEST estimates that by 2013 there will be a shortfall of almost 20,000 science professionals in Australia<sup>4</sup>. This disturbing statistic has at its core the need to enhance our capacity to attract and retain teachers; to interest children in science in schools; and to maintain a high standard of tertiary education in scientific disciplines and in teacher training.

Tom Spurling  
President  
October 2006

<sup>2</sup> Zhang, Gourley and Soriano (2006) *Analysing the Terms of Trade Effect on GDP and Employment in the Presence of Low Real Unit Labour Costs*, ABS Research Paper, ABS, Canberra.

<sup>3</sup> IDP Australia (2006), *Australia's Exports of Education Services*, IDP, Canberra.

<sup>4</sup> DEST (2006), *Audit Of Science Engineering And Technology Skills*, DEST, Canberra.

# **FASTS' Key Challenges for Australian Science and Technology in the Next Decade**

- 1. Increase the level of scientific knowledge and technological capability in Australia to enhance the capacity for greater science-based innovation*
- 2. Provide a comprehensive education in science and mathematics from kindergarten through to postgraduate training to prepare our population to meet new challenges*
- 3. Attract motivated science graduates with a long-term commitment to school teaching*
- 4. Encourage more science graduates to address the projected skills shortage in science and technology*
- 5. Contribute to a turn-around in the deteriorating balance of payments through innovation and the creation of knowledge-based products and services*
- 6. Improve the capacity of scientific societies to monitor and maintain the health of scientific disciplines*



# FASTS Principles

- 1. Science and technology are the keys to a high quality of life based on a sustainable environment and a healthy economy.*
- 2. Education and training in science underpin a knowledge-based, competitive economy, and should be set in the context of modern society and modern science practice.*
- 3. Australia must nurture, attract, and retain an internationally competitive science and technology workforce, operating at the highest standards of professional and ethical conduct.*
- 4. Support of the nation's science and technology infrastructure in universities and government research agencies is a public responsibility.*
- 5. The nation has a particular responsibility to support long-term basic research because it provides high-level human capacity to create future benefits and address unforeseen challenges.*
- 6. International engagement through research excellence is essential in the global scientific community in order to drive knowledge transfer.*
- 7. Industry and government have a joint interest to invest in applied research and development.*
- 8. A national innovation framework is essential for stability of funding, long-term planning and whole-of-government implementation.*

The FASTS Policy statements are listed under these key principles in the remainder of the document. More detail on the individual policy statements is available on the FASTS website:

[www.fast.org](http://www.fast.org)

# **FASTS POLICY STATEMENTS**

## ***1. Science and technology are the keys to a high quality of life based on a sustainable environment and a healthy economy.***

### **POLICY STATEMENT 1.1**

Australian investment in both private and publicly-funded R&D needs to be at levels comparable with those of our international competitors.

### **POLICY STATEMENT 1.2**

Scientists must be provided with the time, resources and infrastructure to create high quality research, educational and professional contributions to society.

### **POLICY STATEMENT 1.3**

The social benefit of the outcomes of publicly-funded scientific research should be widely communicated to demonstrate the value of this investment, beyond the immediate field of science; communication of science is therefore a responsibility both of scientists, and of government.

### **POLICY STATEMENT 1.4**

Effective and healthy scientific and technological societies benefit the nation through cross-institutional networks, which can more readily identify and respond to changes in national capabilities.

## ***2. Education and training in science underpin a knowledge-based, competitive economy, and should be set in the context of modern society and modern science practice.***

### **POLICY STATEMENT 2.1**

Science training provides skills and insights for people that are useful in all walks of life as well as in science, and contributes to a scientifically-literate society.

### **POLICY STATEMENT 2.2**

Science and mathematics teachers should have degree qualifications and up-to-date knowledge in the relevant disciplines.

### **POLICY STATEMENT 2.3**

When the market fails to meet demand, public funding should be used to provide

incentives - for example by reducing HECS liabilities - to increase the number of science and mathematics teachers.

#### **POLICY STATEMENT 2.4**

To enable more equitable engagement within modern society and more informed debate, students should undertake science and mathematics courses throughout their school education at levels suited to their abilities and aspirations.

#### **POLICY STATEMENT 2.5**

Science and mathematics curricula must engage students' interests, aspirations and abilities, as well as international standards of excellence and rigour.

#### **POLICY STATEMENT 2.6**

Understanding the principle of how science works, whereby ideas are adopted after being continuously and rigorously tested, should be widely understood to dispel the promulgation of pseudo-science.

#### **POLICY STATEMENT 2.7**

Primary and secondary schools must be adequately resourced to provide quality teaching of science and mathematics.

#### **POLICY STATEMENT 2.8**

A high quality research environment enriches university science and mathematics teaching.

### ***3. Australia must nurture, attract, and retain an internationally competitive science and technology workforce, operating at the highest standards of professional and ethical conduct.***

#### **POLICY STATEMENT 3.1**

The international exchange of students and scientists enhances the science and technology workforce, and Australia should attract overseas students by offering internationally competitive degrees at both undergraduate and postgraduate levels with transferability between overseas higher education systems.

#### **POLICY STATEMENT 3.2**

Managing and supporting the global mobility of scientists must be addressed proactively, and to inform this process Government should undertake detailed longitudinal studies of the trends and capacity in Australia's scientific and technologically trained population.

### **POLICY STATEMENT 3.3**

Australia needs to ensure that our science and technology workforce is valued internationally by guaranteeing robust accreditation and quality assurance.

## ***4. Support of the nation's science and technology infrastructure in universities and government research agencies is a public responsibility.***

### **POLICY STATEMENT 4.1**

Excellence in teaching and in research is a public responsibility in a modern society and must be resourced appropriately by Government funding.

### **POLICY STATEMENT 4.2**

Publicly-funded infrastructure for science and technology should support the nation's underlying research capacity.

### **POLICY STATEMENT 4.3**

Major national science and technology facilities must be publicly supported as important tools for collaborative private and public research, for international leverage and collaboration, and for research in the national interest.

## ***5. The nation has a particular responsibility to support long-term basic research because it provides high-level human capacity to create future benefits and address unforeseen challenges.***

### **POLICY STATEMENT 5.1**

To prepare for unforeseen benefits and challenges, Australia must maintain an internationally competitive level of pure basic research in science and technology across a range of disciplines.

### **POLICY STATEMENT 5.2**

To address areas of national importance and of potential competitive advantage, Australia must also support strategic basic research in the public good through public funding of government science agencies including CSIRO, GA, ANSTO and AIMS.

### **POLICY STATEMENT 5.3**

Independent, robust and accountable agencies such as the ARC and NH&MRC must

be well supported as the principal providers of competitive basic research funding based on expert assessment of excellence.

***6. International engagement through research excellence is essential in the global scientific community in order to drive knowledge transfer.***

**POLICY STATEMENT 6.1**

Australia must strive for research excellence that creates credibility to leverage overseas research, particularly in areas of science that provide exchangeable underlying capacity for exploiting future opportunities.

**POLICY STATEMENT 6.2**

Australia should strengthen its scientific engagement with Asia-Pacific economies to exchange expertise and share facilities.

**POLICY STATEMENT 6.3**

There is a need for Government and professional scientific societies to work together to foster international engagement through research linkage programmes, hosting international conferences, and personnel exchange and training schemes.

***7. Industry and government have a joint interest to invest in applied research and development.***

**POLICY STATEMENT 7.1**

The economy must provide a sustainable future for Australia by reversing the increasing balance of payments deficit, through the development of 'new to the world' products and services based on scientific and technological innovation.

**POLICY STATEMENT 7.2**

Long-term strategies are needed to change cultural attitudes in Australia to encourage innovation, and to address structural influences on the level of BERD.

**POLICY STATEMENT 7.3**

Scientific and technological expertise on Australian boards and in management should be increased to help identify solutions to risks and opportunities associated with technological developments.

#### **POLICY STATEMENT 7.4**

Government should encourage innovation through economic policy settings (for example, on R&D tax concessions, capital gains tax rates, venture capital programmes) but should also ensure that the incentives are simple and conducive to long-term planning.

#### **POLICY STATEMENT 7.5**

To encourage partnerships for innovation and commercialisation, the government should place greater emphasis on support programmes such as CRCs and Rural Development Corporations with long-term horizons.

### ***8. A national innovation framework is essential for stability of funding, long-term planning and whole-of-government implementation.***

#### **POLICY STATEMENT 8.1**

Australia needs a nimble, open and evolving innovation framework that integrates science and technology into its democratic institutions to engage with national priorities and to deal with emerging global issues.

#### **POLICY STATEMENT 8.2**

A body is required to monitor and coordinate the diversity and balance of scientific activity across all portfolios and all levels of government to capture the maximum benefit for the nation's scientific investment.

#### **POLICY STATEMENT 8.3**

PMSEIC should continue to play a key coordinating role in communicating the capacity of science, engineering and innovation to contribute to national priorities and goals.

#### **POLICY STATEMENT 8.4**

FASTS supports the continuation of the office of Chief Scientist as a full time appointment.

#### **POLICY STATEMENT 8.5**

Australian scientific societies should play a key role in overseeing the capacity of the scientific discipline base.

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