



Queensland R&D Priorities 2008 Implementation Report

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Based on information supplied by Queensland Government agencies on their R&D activities for the 2007-08 financial year. The Queensland Chief Scientist would like to thank all agency coordinators and staff for their continued collaboration during the data collection process.

Purpose of this document

This document reports on the data collected by the Office of the Queensland Chief Scientist on Research and Development (R&D) undertaken and/or funded by Queensland Government agencies for the 2007-08 financial year. It includes Queensland Government expenditure on in-house and outsourced R&D, as well as funds leveraged from external sources for both in-house and outsourced R&D (see Figure 1).¹ As such it differs from R&D expenditure values reported by the Australian Bureau of Statistics (ABS), which include only in-house R&D expenditure.

The 2008 Implementation Report provides information on:

- the extent to which agencies are conducting/funding R&D across the six endorsed Queensland R&D Priorities
- the extent to which agencies are successfully leveraging funds from other sources to help conduct their research
- the extent to which agencies are conducting R&D in-house and/or providing funds for R&D to be conducted at external organisations.

Reporting of 2007-08 Queensland Government R&D expenditure

R&D definition

To maintain consistency and provide long-term comparability nationally and internationally, the Organisation for Economic Co-operation and Development (OECD) definition of R&D (also used by the ABS) is used for the collection process:

*Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.*²

Response from agencies

The Queensland Government comprised 23 departments during the 2007-08 data collection period. Twenty of these, together with Queensland Museum, provided details of R&D expenditure in 2007-08 and its alignment with the Queensland R&D Priorities through the Queensland R&D Priorities Database. Three agencies – the Department of Infrastructure and Planning, Queensland Corrective Services, and Queensland Police Service – reported no R&D expenditure.

¹ Herein, R&D expenditure refers to money expended or leveraged for in-house or outsourced R&D.

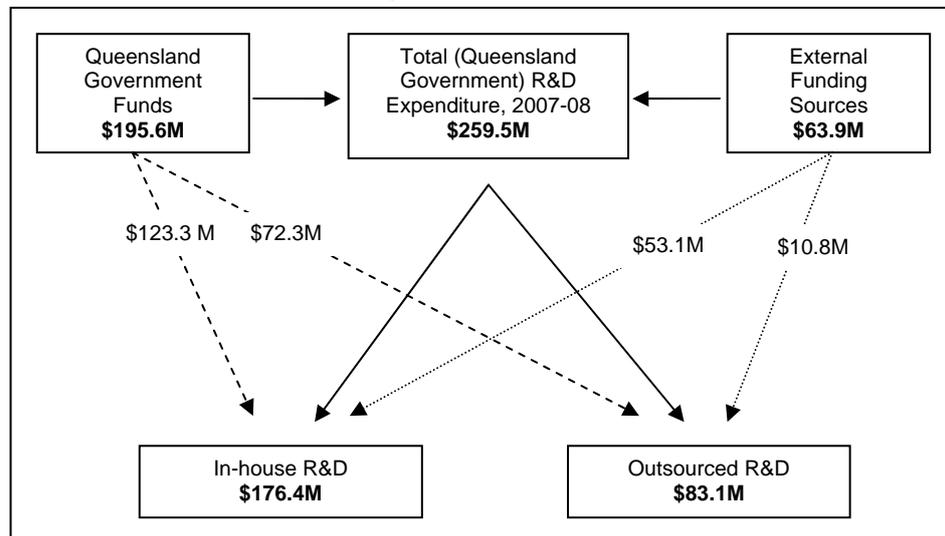
² OECD (2002) *Proposed Standard Practice for Surveys on Research and Experimental Development, Frascati Manual 2002*, Paris.

The majority of Queensland Government agencies invested in R&D by conducting in-house research, partnering with other organisations to perform R&D, funding research on a contract or grant basis, or investing in research infrastructure.

Summary of 2007-08 R&D expenditure

In 2007-08, Queensland Government agencies reported a total R&D expenditure of \$259.5M, comprising \$195.6M (75%) from Queensland Government and \$63.9M (25%) from external sources (Figure 1). In-house R&D accounted for \$176.4M (68%) of total R&D expenditure, and outsourced R&D for \$83.1M (32%).

Figure 1: Breakdown of R&D expenditure reported by Queensland Government agencies, 2007-08



Total R&D expenditure in 2007-08 increased by \$60.9M over the previous financial year, recovering from a sharp downturn in expenditure in 2006-07, and resulting in a net 2% (4.9M) increase over the past five years (Figure 2).³

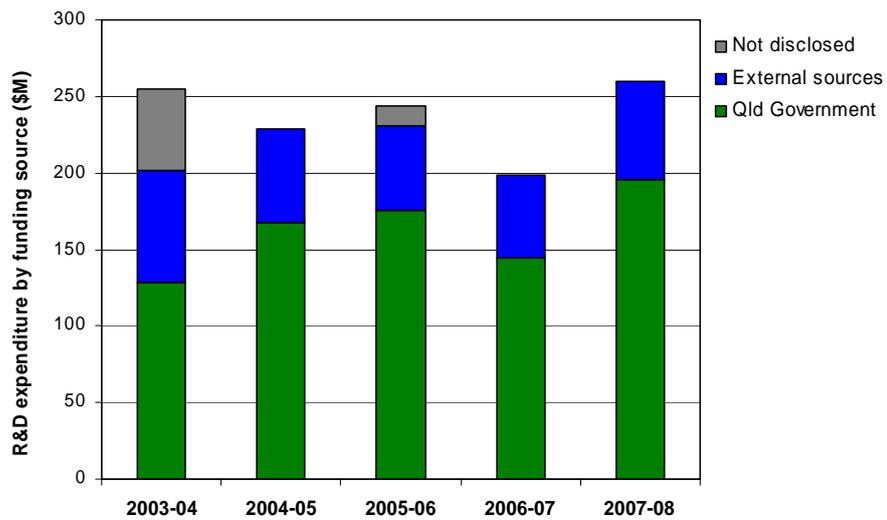
The proportional contribution by Queensland Government and external sources has remained relatively stable since 2004-05 at 73-75% and 25-27%, respectively.^{4,5}

³ All values herein are in current prices.

⁴ Funding source data for 2003-04 and 2005-06 is incomplete.

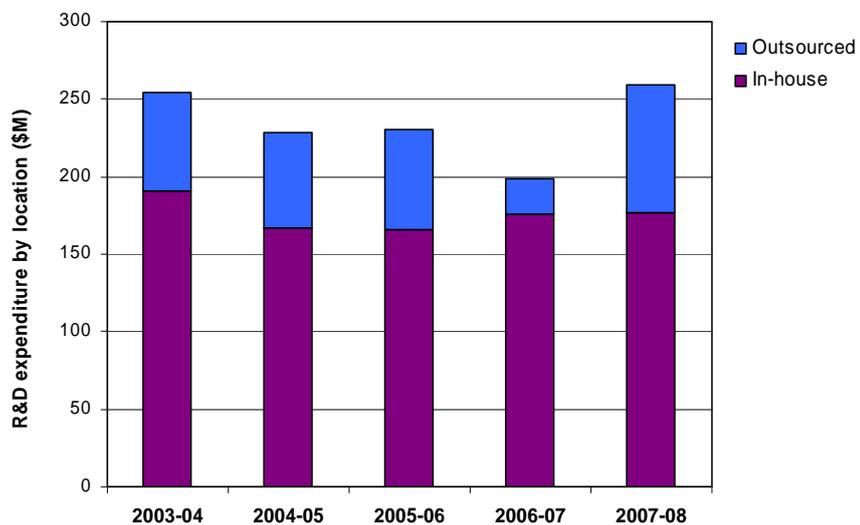
⁵ Herein, 2005-06 and 2006-07 values have been revised such that R&D funding from other Queensland Government departments is included in the Queensland Government portion of R&D expenditure rather than the external sources portion. This increased Queensland Government-funded R&D values by 2-3% and reduced externally-funded R&D values by 6-7% compared with previously reported values.

Figure 2: R&D expenditure by funding source, 2003-04 to 2007-08



Queensland Government in-house R&D expenditure decreased slightly over the past five years from \$190.6M in 2003-04 to \$176.4M in 2007-08⁶, consistent with decreasing trends reported by the ABS (Figure 3).⁷ In contrast, the level of outsourced R&D varied significantly over the past three years, and was the primary cause of the marked decrease in total R&D expenditure in 2006-07, and its recovery in 2007-08.

Figure 3: R&D expenditure by location, 2003-04 to 2007-08



⁶ Herein, 2005-06 and 2006-07 values have been revised such that R&D performed by other Queensland Government departments is included under in-house R&D rather than outsourced R&D. This increased Queensland Government in-house R&D values by 1-2% and reduced outsourced R&D values by 2% (2005-06) and 14% (2006-07) compared with previously reported values.

⁷ Queensland Government in-house R&D expenditure reported by the ABS was \$46M and \$68M greater than that reported here by Queensland Government agencies for 2004-05 and 2006-07, respectively. The reason for this discrepancy is being investigated.

R&D expenditure of Queensland Government agencies

The spread of R&D expenditure for 2006-07 and 2007-08 across Queensland Government agencies is displayed in Table 1.

Overall, environment- and industry-related departments accounted for 85% of total R&D expenditure, whereas human services departments accounted for 11%, and Queensland Treasury and the Department of Premier and Cabinet accounted for 4%.

Several departments increased their R&D investments substantially between 2006-07 and 2007-08, most notably, the Department of Mines and Energy (\$21M), the Department of Tourism, Regional Development and Industry (\$19.8M), the Environmental Protection Agency (\$7.2M), Queensland Health (\$10.1M) and Queensland Treasury (\$9.8M). The only substantial reduction in R&D expenditure was that of the Department of Natural Resources and Water, which decreased by \$13.3M. This was primarily due to restructuring of R&D activities, including the re-allocation of biosecurity, climate change and mines and energy research to other departments.

Table 1: Queensland Government agency R&D expenditure, 2006-07 and 2007-08

Queensland Government Agency	R&D Expenditure (\$,000)		% of Total R&D Expenditure	
	2006-07	2007-08	2006-07	2007-08
ENVIRONMENTAL/INDUSTRY-RELATED DEPARTMENTS				
DPI&F	107,489	107,335	54%	41%
DME	14,204	39,605	7%	15%
DNRW	40,524	27,274	20%	11%
DTRDI*	5,873	25,653	3%	10%
QT	3,972	1,707	2%	1%
QM	3,181	3,329	2%	1%
DPW	2,830	1,920	1%	1%
EPA	2,553	9,778	1%	4%
DLGSR*	2,344	3,242	1%	1%
DMR	1,000	1,216	1%	<1%
DI&P*	0	0	0%	0%
HUMAN SERVICES DEPARTMENTS				
QH	8,737	18,813	4%	7%
DETA	2,183	3,653	1%	1%
DCS	1,341	2,006	1%	1%
DH	702	631	<1%	<1%
DES	680	668	<1%	<1%
DSQ	485	1,025	<1%	<1%
DC	261	336	<1%	<1%
JAG	225	65	<1%	<1%
DEIR	0	1,350	0%	1%
QCS	0	0	0%	0%
QPS	0	0	0%	0%
OTHER				
TREASURY	0	9,829	0%	4%
DPC	0	95	0%	<1%
Total	198,584	259,530	100%	100%

* In 2006-07 DLGSR was DLGSR, and thus included planning, now part of DI&P.

DTRDI was formerly DSD in 2006-07.

Alignment of R&D expenditure with Queensland R&D Priorities

In 2007-08, Queensland Government Priorities were replaced with *Toward Q2: Tomorrow's Queensland*, encompassing five ambitions, each with two targets. An alignment of the Queensland R&D Priorities with each of the *Toward Q2* ambitions is provided in Table 2.

Table 2: Alignment of *Toward Q2: Tomorrow's Queensland* ambitions with the Queensland R&D Priorities

<i>Toward Q2</i> Ambition	<i>Toward Q2</i> Strategic Targets	Queensland R&D Priority			Area
Strong Creating a diverse economy powered by bright ideas	<p><i>2020 Target:</i> Queensland is Australia's strongest economy, with infrastructure that anticipates growth</p> <p><i>2020 Target:</i> Increase by 50 per cent the proportion of Queensland businesses undertaking research and development or innovation</p>	Enabling Sciences and Technologies	Smart Industries		Economic
Smart Delivering world-class education and training	<p><i>2020 Target:</i> Three out of four Queenslanders will hold trade, training or tertiary qualifications</p> <p><i>2020 Target:</i> All children will have access to a quality early childhood education so they are ready for school</p>				
Healthy Making Queenslanders Australia's healthiest people	<p><i>2020 Target:</i> Cut by one third obesity, smoking, heavy drinking and unsafe sun exposure</p> <p><i>2020 Target:</i> Queensland will have the shortest public hospital waiting times</p>	Health and Well-being		Tropical Opportunities	Social
Fair Supporting safe and caring communities	<p><i>2020 Target:</i> Halve the proportion of Queensland children living in households without a working parent</p> <p><i>2020 Target:</i> Increase by 50 percent the proportion of Queenslanders involved in their communities as volunteers</p>				
Green Protecting our lifestyle and environment	<p><i>2020 Target:</i> cut by one-third Queenslanders' carbon footprint with reduced car and electricity use</p> <p><i>2020 Target:</i> Protect 50 percent more land for nature conservation and public recreation</p>	Environmentally Sustainable Queensland		Safeguarding Queensland	Environmental

In reporting R&D expenditure, Queensland Government agencies aligned each project with one or more of the six Queensland R&D Priorities. The proportion of 2007-08 R&D expenditure in each priority area, together with trends in proportional expenditure in each area, is shown in Figures 4 and 5.

Figure 4: R&D expenditure by Queensland R&D Priority, 2007-08

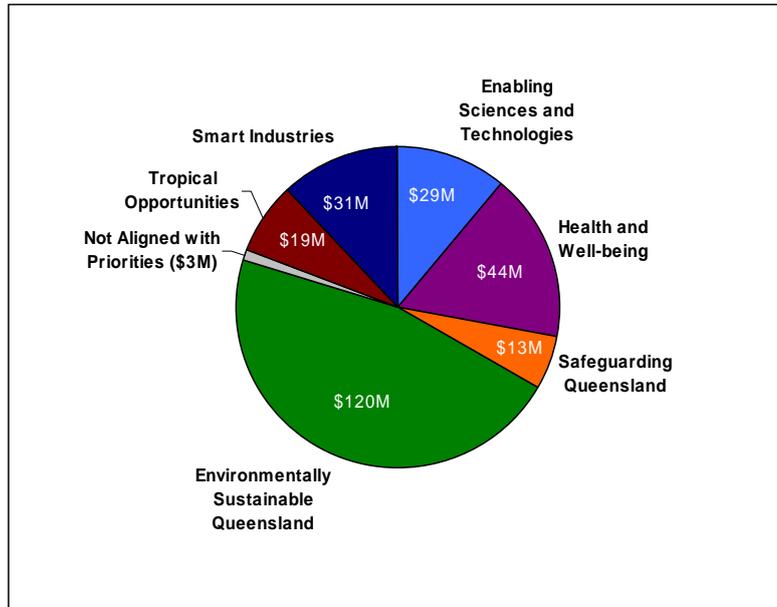
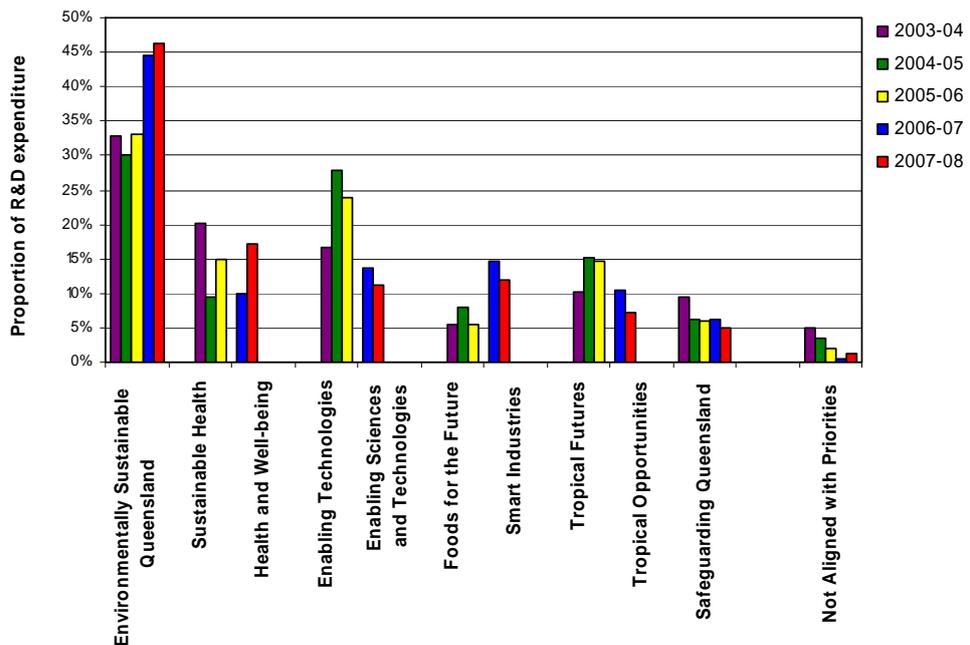


Figure 5: R&D expenditure by Queensland R&D Priority, 2003-04 to 2007-08*



* Includes original and revised Queensland R&D Priorities

In 2007-08, as in every year since the collection of agency R&D expenditure data, the *Environmentally Sustainable Queensland* priority area attracted the largest proportion of R&D funding. This share increased substantially in the past two years, from 33% in 2005-06 to 46% in 2007-08. This reflects the Queensland Government's commitment to solving many of the pressing climate change, water and other environment-related challenges of today and into the future.

The high priority of environmental R&D in Queensland Government is also illustrated by the \$200M committed to developing the Ecosciences Precinct at Boggo Road, due for completion in 2011, to bring together over 1,000 environmental researchers from four Queensland Government departments and the Commonwealth Scientific and Research Organisation (CSIRO). Low emission energy R&D is another focus area, including the \$300M Clean Coal Fund and the \$50M Renewable Energy Fund, both established in 2007.

The level of funding in the *Sustainable Health/Health and Well-being* priority area has varied considerably over the past five years, ranging from less than 10% of total R&D expenditure to more than 20%. In 2007-08, funding of this area increased from 10% to 17%.⁸ Support for this area is likely to continue in the future through the development in 2008 of the \$25.7M Health and Medical Research Program as part of *Smart State Strategy: 2008-2012*. The initiative includes a \$20.6M Health Research Fellowship Program, a \$1.5M Knowledge Transfer Initiative to improve the translation of medical R&D into better health outcomes, and the establishment of the Office of Health and Medical Research in Queensland Health to lead and coordinate R&D activity.

The priority areas of *Enabling Sciences and Technologies* and *Smart Industries* received 11% and 12% of R&D funding, respectively, in 2007-08. R&D captured under the *Enabling Sciences and Technologies/Enabling Technologies* priority area is of a fundamental nature and underpins advances in a broad range of areas. The *Smart Industries* priority area replaced the *Foods for the Future* R&D priority to better capture R&D that builds on the innovativeness of Queensland's established and emerging industries. Together, these priority areas help build the productivity and competitiveness of Queensland's industry sector. Thus, the decrease in proportional funding of these combined areas from 36% to 23% over the past four years is a worrying trend.

The *Tropical Opportunities* priority area attracted 7% of R&D funding in 2007-08, less than half its share four years ago. Tropical R&D is a clear area of competitive advantage for Queensland, through the considerable natural resources at our doorstep, our international reputation as host of the World Heritage-listed Great Barrier Reef and Wet Tropics, and through Queensland's critical mass in tropical R&D expertise, including the Australian

⁸ As noted in the 2007 *Queensland R&D Priorities Implementation Report*, the health component of this priority area may be undervalued. To enable more comprehensive reporting in future years, Queensland Health introduced a new IT system for R&D reporting in October 2008.

Tropical Science and Innovation Precinct, the Australian Tropical Forest Institute, and the Australian Institute of Marine Science. Hence, the downturn in tropical R&D expenditure is a concerning one, but one that will hopefully be rectified by the development in 2008 of the *Q-Tropics Strategy* to strengthen, commercialise and export Queensland's tropical expertise. Included is a \$19.45M Queensland Government commitment to the \$50M Queensland Tropical Health Alliance between James Cook University, the Queensland Institute of Medical Research, Griffith University and Queensland University of Technology, to provide infrastructure for tropical disease research.

R&D investment in the *Safeguarding Queensland* priority area has remained steady over the past four years, accounting for 5-6% of R&D expenditure. Continued support for this research area is important in addressing current and emerging threats to the health and safety of Queenslanders and the Queensland environment.

The proportion of R&D expenditure not aligned with the Queensland R&D Priorities has remained minimal in 2007-08 at 1%.

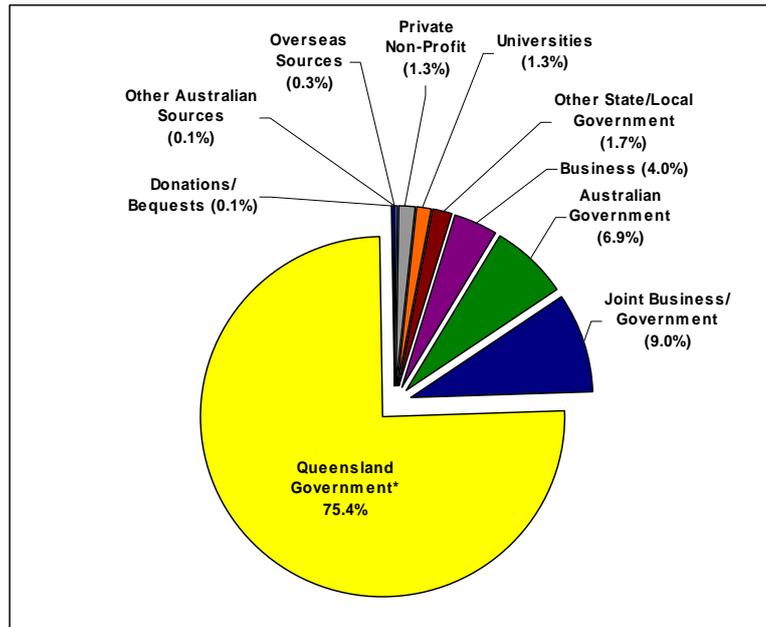
Funding sources

Queensland Government R&D expenditure includes R&D funded by Queensland Government agencies and funds leveraged from external sources, including industry, Commonwealth and other governments, universities, not-for-profit organisations, philanthropic organisations, and other Australian and overseas sources. In 2007-08, as previously, external R&D funds were primarily sourced from joint/business government (eg Co-operative Research Centres), Australian Government, and business, and accounted for 25% of all R&D investments (Figure 6).

This is equivalent to a leveraging rate of \$0.33 for every Queensland Government \$1.00 invested in R&D. This is a slight decrease from the 2006-07 leveraging rate of \$0.38 for every \$1.00 invested, and the leveraging rate has not improved since this information was first collected in 2004-05.

Interestingly, in-house R&D (valued at \$176.4M) was leveraged at a rate of \$0.43 for every \$1.00 invested by Queensland Government in 2007-08, whereas outsourced R&D (valued at \$83.1M) was leveraged at a rate of only \$0.15 for every \$1.00 invested by Queensland Government (see Figure 1). There is anecdotal evidence that this poor leveraging rate for outsourced R&D is due in part to incomplete reporting by Queensland Government agencies.

Figure 6: Total R&D funding by source, 2007-08

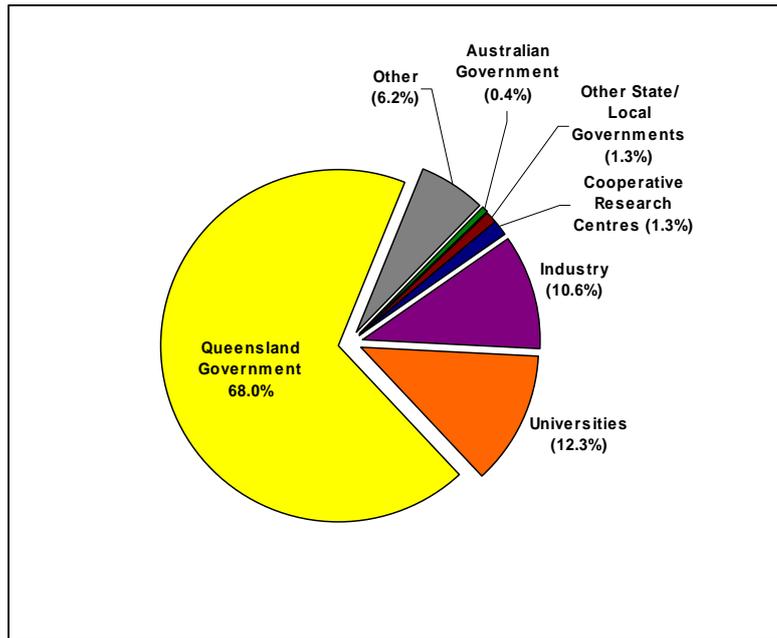


In addition to increasing the pool of R&D funds, leveraging of investments from local, national and international sources can facilitate the formation of collaborative networks, and the establishment of partnerships with key players in the technology and commercialisation pipeline. There is a clear opportunity to improve the leveraging power of Queensland Government R&D.

Location of research

Of the R&D expenditure reported by Queensland Government agencies in 2007-08, 68% (\$176.4M) was performed in-house and 32% (\$83.1M) was outsourced. Universities accounted for the largest proportion of outsourced R&D (12.3% of total R&D expenditure), followed by industry (10.6%) (Figure 7).

Figure 7: Sectors performing R&D, 2007-08

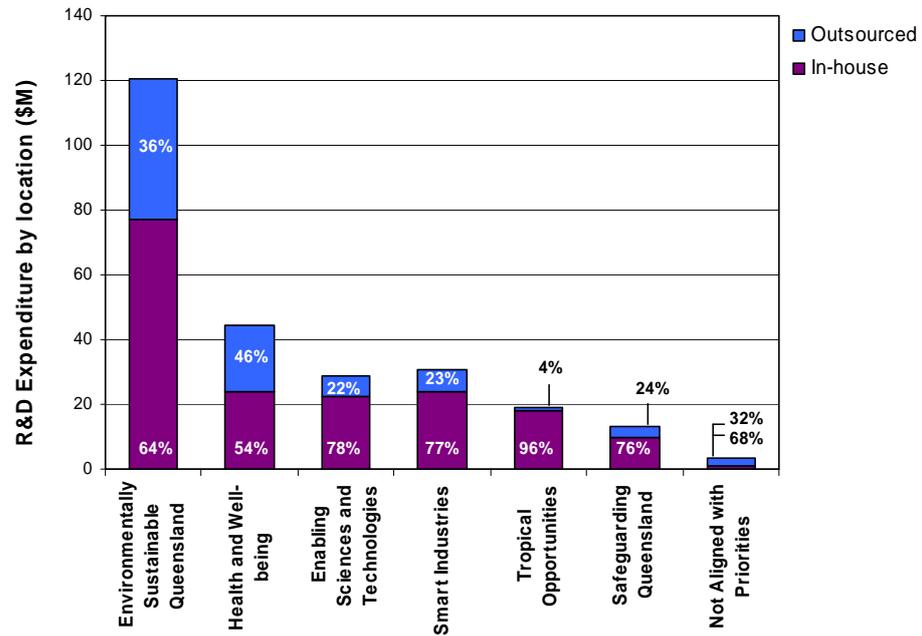


The *Environmentally Sustainable Queensland* priority area accounted for the largest amount of in-house R&D (\$77.1M) (Figure 8). Interestingly, of all priority areas, *Tropical Opportunities* had the largest proportion of its R&D carried out in-house, at 96%. This is somewhat surprising given the vast expertise in this area outside of Government in Queensland's scientific community.

The *Environmentally Sustainable Queensland* priority area also accounted for the greatest amount of outsourced R&D (\$43.3M, or 36% of R&D in that area). This is in stark contrast to the situation in 2006-07, where only 4% of R&D under this priority was outsourced. Major outsourced projects contributing to this increased figure in 2007-08 include the Callide A Oxyfuel and ZeroGen clean coal projects funded by the Clean Coal Fund (\$22.4M), the Centre for Low Emission Technology (\$2.2M), the South East Queensland Urban Water Security Research Alliance (\$4.6M), and several university-based environmental R&D projects funded by the Smart State Innovation Funds (\$7.1M).

The *Health and Well-being* priority area had the greatest proportion of its R&D outsourced, at 46% (\$20.2M). This is because a substantial portion of social science R&D reported by the human services departments was performed by the university sector. In addition, \$7.6 million of the Smart State Innovation Funds and \$1.8 million of Queensland Health R&D investments funded external medical research.

Figure 8: Sectors performing R&D by Queensland R&D Priority area, 2007-08



Future directions

R&D Queensland

In 2007, Cabinet expanded the role of the Queensland Chief Scientist to include chairing R&D Queensland, a whole-of-Government committee tasked with ensuring that R&D activities of Queensland Government agencies are integrated with the Government's *Toward Q2: Tomorrow's Queensland* strategy and the Queensland R&D Priorities, and improving communication and collaboration both amongst Queensland Government agencies and with external parties.

As a first step towards establishing R&D Queensland, the Queensland Chief Scientist convened two half-day forums in the areas of environmental/industrial and health/social R&D in February 2008.

Executives from R&D departments in each of these areas were asked to present on –

- the over-arching goals/targets that they envisaged driving departmental R&D
- the ways in which existing R&D programs address these goals/targets
- ways in which collaborative R&D with other agencies could further improve these outcomes.

It was clear from the health/social R&D forum that there is support for –

- improved collaboration and co-operation across Queensland Government human services departments and between all levels, including R&D, policy, program and service delivery levels
- improved ICT resources and data sharing between agencies
- investing in preventative and early intervention strategies
- structuring R&D investment and strategies to explicitly tackle the disadvantaged minority
- improving the translation of research outcomes into policy and practice.

Key messages from the environment/industry R&D forum included –

- R&D and technological innovations have the potential to break the nexus between economic growth and environmental degradation
- a long-term approach is required to tackle environmental issues, particularly because progress can be difficult to measure in the short term
- better dialogue between agencies and stakeholders is required, particularly due to rapid changes in technology and knowledge in the environmental arena, the many factors out of human control, and the significant knowledge gaps
- opportunities for greater collaboration between Queensland Government agencies exist, but barriers include differing priorities of industry- versus environment-focussed agencies, reluctance of agencies to release data, and concerns relating to potential loss of R&D funding or staff
- an ageing Queensland Government R&D workforce and a reduction in the proportion of students undertaking science and engineering degrees is likely to lead to critical shortages in skilled environmental R&D personnel in the near future.

On 26 November 2008, the first R&D Queensland meeting was held with representatives from the leading Queensland Government agencies undertaking R&D, including –

- Department of Primary Industries and Fisheries
- Department of Natural Resources and Water
- Department of Mines and Energy
- Department of Tourism, Regional Development and Industry
- Queensland Health
- Queensland Transport
- Environmental Protection Agency
- Department of Education, Training and the Arts
- Department of Communities.

There was a consensus that scope existed for improved coordination, collaboration, leveraging and prioritisation of the R&D activities of Queensland Government. It was agreed that the Office of the Queensland Chief Scientist would generate draft R&D plans in the health/social and environmental areas

for discussion at the next meeting. These will be based on background papers produced by the Office of the Chief Scientist on Queensland's strengths in health/social and environmental R&D⁹, together with departmental R&D plans, and will help inform future recommendations of R&D Queensland on the prioritisation of Queensland Government R&D investments.

Improved R&D reporting

There have been many improvements in the reporting, coordination and strategic direction of Queensland Government R&D investments over the past five years through a range of initiatives, including the generation of departmental R&D plans, the reporting of R&D outcomes through the Queensland R&D Priorities Database, and, more recently, the formation of R&D Queensland.

However, there are several areas where these activities can be improved, including –

- rectifying discrepancies between in-house R&D expenditure reported by Queensland Government agencies to the Office of the Queensland Chief Scientist and that reported to the ABS
- improved reporting of leveraged R&D investments
- improved alignment of R&D projects with the Queensland R&D Priorities for some agencies
- improved alignment of agency R&D projects with objectives outlined in R&D plans
- sharing of R&D information between Government agencies through the Register of Strategic Information (ROSI).

⁹ Produced for the first meeting of R&D Queensland, 26 November 2008, and available from the Office of the Queensland Chief Scientist on request.