

Queensland Government R&D expenditure 2008-09 report

Compiled by the Office of the Queensland Chief Scientist

Based on information supplied by Queensland Government departments on their R&D activities for the 2008-09 financial year. The Office of the Queensland Chief Scientist would like to thank departmental staff for their continued collaboration during the data collection process.

1. Purpose of report

Introduction

The Queensland Government invests in research and development (R&D) to provide the knowledge, technologies and tools necessary to meet the challenges and harness the opportunities for a strong, green, smart, healthy and fair Queensland.

While some of the required knowledge and tools can be adopted from elsewhere, there are Queensland-specific issues and opportunities that impact the economy, environment and Queenslanders' health and wellbeing that require the State's expertise and R&D efforts.

Queensland Government also plays a role in stimulating higher education and business R&D, attracting the best minds to the State, building knowledge and expertise, leveraging Federal and international funding, and strengthening and diversifying Queensland's industries for the future.

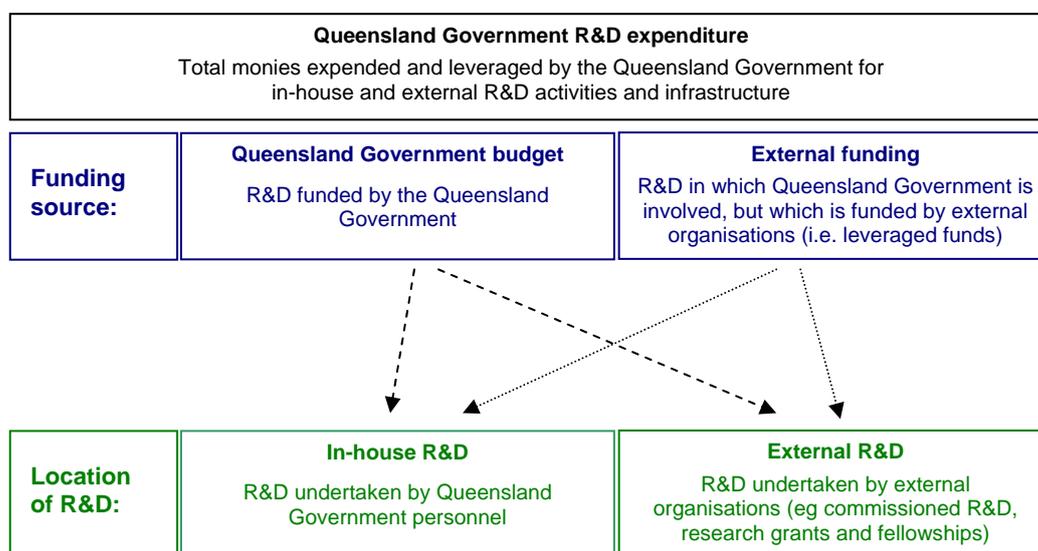
The Queensland Government is involved in R&D in several ways:

- undertaking R&D itself – to underpin services to the State, including protecting Queensland's environment, natural resources and food supply; safeguarding Queenslanders' health and wellbeing; providing reliable infrastructure and services
- commissioning research – to inform policy and decision making
- facilitating research – through grants, fellowships, infrastructure and a range of policies that support Queensland's higher education and business R&D.

Scope

This report provides financial information on R&D activities and infrastructure investments of the Queensland Government for the 2008-09 financial year (see Figure 1).¹

Figure 1: Breakdown of Queensland Government R&D expenditure



¹ R&D expenditure reported here differs from that which is reported for the Queensland Government by the Australian Bureau of Statistics, which refers solely to in-house R&D (funded by the Queensland Government and external sources).

The report includes an analysis of:

- the level of R&D expenditure reported by Queensland Government departments
- the breakdown of R&D by the funding source, i.e. who provides the funding
- the breakdown of R&D by the location of R&D activity, i.e. where the R&D is undertaken
- the alignment of R&D expenditure across the six Queensland R&D Priorities –
 1. Enabling Sciences and Technologies
 2. Environmentally Sustainable Queensland
 3. Health and Wellbeing
 4. Safeguarding Queensland
 5. Smart Industries
 6. Tropical Opportunities.

R&D definition

R&D is defined in accordance with the Organisation for Economic Cooperation and Development (OECD) definition (also used by the Australian Bureau of Statistics) as:

*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

R&D expenditure refers to monies expended, not monies committed, in the 2008-09 financial year. It includes capital expenditure, such as the acquisition of land, buildings and equipment, and current expenditure, including labour costs, consumables and operating expenses. It does not include in-kind support.

Data collection

R&D expenditure data are provided to the Office of the Queensland Chief Scientist by each of the Queensland Government's departments, as well as the Queensland Museum. Data are not collected from Government-owned corporations.

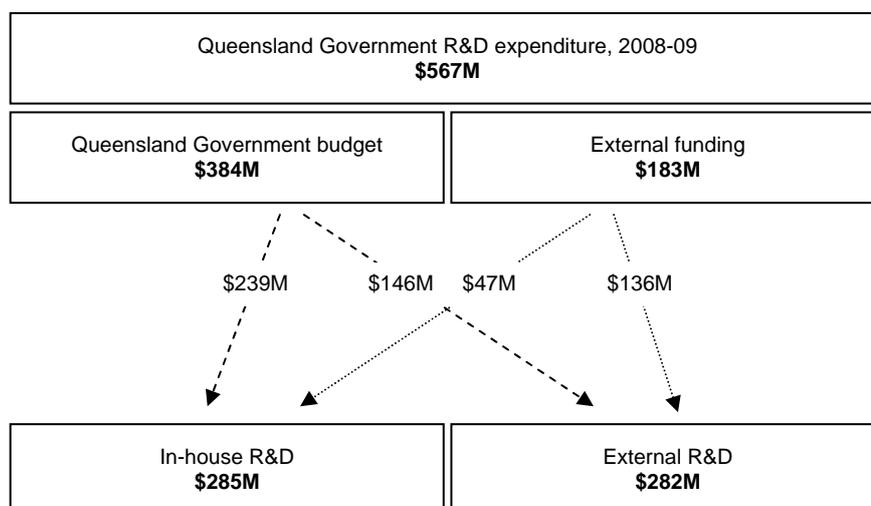
During 2008-09, the Queensland Government underwent a machinery-of-Government (MOG) change, streamlining 23 departments into 13. All 13 departments and the Queensland Museum provided R&D expenditure data for 2008-09.

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

2. Snapshot of Queensland Government R&D expenditure, 2008-09

- In 2008-09, Queensland Government R&D expenditure was valued at \$567M, including \$384M (68%) from the Queensland Government and \$183M (32%) from external sources (Figure 2).
- This is more than double the \$260M invested in R&D in 2007-08, including a \$189M (97%) increase in the Queensland Government's R&D budget.
- Much of this increase resulted from the delivery of infrastructure commitments made in earlier years.
- For every \$1.00 invested in R&D by the Queensland Government, \$0.48 was leveraged from external sources, a 45% increase over 2007-08 leveraging rates.
- In contrast to the overall increase in leveraged funds, the level of external funding of Queensland Government in-house R&D fell from \$53M to \$47M between 2007-08 and 2008-09.
- External R&D and in-house R&D each accounted for around half of total R&D expenditure.
- Consistent with previous years, of Queensland Government's six R&D Priorities, *Environmentally Sustainable Queensland* received the most funding (37%), followed by *Health and Wellbeing* (20%).

Figure 2: Breakdown of Queensland Government R&D Expenditure, 2008-09*



* Values have been rounded, resulting in some minor discrepancies.

3. R&D expenditure by Queensland Government departments

In 2008-09, Queensland Government departments reported an overall R&D expenditure of \$567M, more than double the level of R&D expenditure in the previous financial year.

This abnormally high expenditure is due in large part to financial commitments made in previous years for large one-off R&D related projects, such as:

- research infrastructure, including –
 - the Health and Food Sciences and Ecosciences Precincts (\$102M Queensland Government/\$30M CSIRO)³
 - National Collaborative Research Infrastructure Strategy (NCRIS) projects (\$7M Queensland Government/\$30M pro-rata leveraged funds)⁴
 - the Smart State Medical Research Centre (\$6M)⁵
- the ZeroGen clean coal demonstration project (\$45M Queensland Government/\$46M coal industry funding)⁶
- operational support (ranging from 1 to 10 years) for various university and medical research institutes (\$23M).

It is also a result of improved reporting and performance with respect to leveraged funds from external organisations (see Section 4).

The spread of R&D expenditure across Queensland Government departments for 2006-07 to 2008-09 is displayed in Table 1. The Department of Employment, Economic Development and Innovation accounted for the vast majority of R&D expenditure (\$467M, 82%).

Substantial increases were reported for the Mines and Energy and the Innovation divisions of the Department of Employment, Economic Development and Innovation compared with the previous financial year, primarily due to the significant projects mentioned above.

³ The Health and Food Sciences Precinct and the Ecosciences Precinct will bring together Queensland Government and CSIRO researchers in the areas of human and animal health and food sciences, and environmental research, respectively; <http://www.science.qld.gov.au/dsdweb/v4/apps/web/content.cfm?id=6522>; <http://www.science.qld.gov.au/dsdweb/v4/apps/web/content.cfm?id=6521>

⁴ <http://ncris.innovation.gov.au/Pages/default.aspx>

⁵ <http://www.qimr.edu.au/news/2009/articles/watpac.html>

⁶ <http://www.zerogen.com.au/project/overview.aspx>

Table 1: R&D Expenditure by Queensland Government department, 2006-07 to 2008-09*

Queensland Government Department	R&D Expenditure (\$,000)			% of Total R&D Expenditure		
	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Dept of Employment, Economic Development and Innovation	-	-	467,258	-	-	82%
Innovation [#]	5,873	25,653	243,534	3%	10%	43%
Qld Mines and Energy	14,204	39,605	117,490	7%	15%	21%
Qld Primary Industries and Fisheries	107,489	107,335	102,907	54%	41%	18%
Liquor, Gaming, Racing and Fair Trade [†]	-	-	1,843			<1%
Employment and Industry Development [‡]	0	1,350	1,484	0%	1%	<1%
Dept of the Environment and Resource Management	-	-	44,559	-	-	8%
Natural Resources and Water	40,524	27,274	31,133	20%	11%	5%
Environmental Protection Agency	2,553	9,778	13,426	1%	4%	2%
Queensland Health	8,737	18,813	29,942	4%	7%	5%
Queensland Treasury	0	9,829	6,861	0%	4%	1%
Dept of Transport and Main Roads	-	-	3,741	-	-	<1%
Queensland Transport	3,972	1,707	2,706	2%	1%	<1%
Main Roads	1,000	1,216	1,036	1%	<1%	<1%
Dept of Education and Training**	2,183	3,653	4,348	1%	1%	<1%
Queensland Museum	3,181	3,329	3,372	2%	1%	<1%
Dept of Communities	-	-	2,793	-	-	<1%
Disability Services	485	1,025	1,093	<1%	<1%	<1%
Communities	261	336	800	<1%	<1%	<1%
Child Safety	1,341	2,006	549	1%	1%	<1%
Housing	702	631	210	<1%	<1%	<1%
Sport and Recreation ^{###}	2,344	3,242	141	1%	1%	<1%
Dept of Community Safety	-	-	1,603	-	-	<1%
Corrective Services	0	0	-	0%	0%	<1%
Emergency Services	680	668	-	<1%	<1%	<1%
Dept of Public Works	2,830	1,920	977	1%	1%	<1%
Police Department	0	0	943	0%	0%	<1%
Dept of the Premier and Cabinet**	0	95	612	0%	<1%	<1%
Dept of Infrastructure and Planning^{###}	0	0	37	0%	0%	<1%
Dept of Justice and Attorney General	225	65	18	<1%	<1%	<1%
Total	198,584	259,530	567,064	100%	100%	100%

* For collaborative projects reported by more than one department, R&D expenditure was divided between the departments, resulting in some departmental totals reported here differing from those provided by departments; values have been rounded, resulting in some minor discrepancies.

[#] 2008-09 R&D expenditure for the Innovation division of the Department of Employment, Economic Development and Innovation is compared here with 2007-08 R&D expenditure values for the former Department of Tourism, Regional Development and Innovation, and 2006-07 R&D expenditure values for the former Department of State Development, Trade and Innovation.

[†] The Liquor, Gaming, Racing and Fair Trade division of the Department of Employment, Economic Development and Innovation includes sections from the former Department of Justice and Attorney General and Queensland Treasury.

[‡] 2008-09 R&D expenditure for the Employment and Industry Development division of the Department of Employment, Economic Development and Innovation is compared with 2006-07 and 2007-08 R&D expenditure values for the former Department of Employment and Industrial Relations.

** The Arts division of the former Department of Education, Training and the Arts moved to the Department of the Premier and Cabinet in 2008-09.

In 2007-08, the Planning division of the former Department of Local Government, Planning, Sport and Recreation moved to the Department of Infrastructure and Planning. In 2008-09, the Sport and Recreation division of the former Department of Local Government, Sport and Recreation moved to the Department of Communities, while the Local Government division moved to the Department of Infrastructure and Planning.

4. R&D Expenditure by funding source (who provides the funding)

In order to maximise its investments in R&D, the Queensland Government leverages funds from external organisations. Many Queensland Government grants require an equal contribution from the external research organisation, and research infrastructure investments involve partner contributions. The Queensland Government also secures competitive research grants for in-house R&D from the Federal Government and other sources.

Of the \$567M invested in R&D in 2008-09, \$384M (68%) was funded by the Queensland Government and \$183M (32%) was leveraged from external sources. This represents a \$189M (97%) increase in the Queensland Government R&D budget and a \$119M (186%) increase in leveraged funds between 2007-08 and 2008-09 (Figure 3).

Thus, for every \$1.00 invested in R&D by the Queensland Government, \$0.48 was leveraged from external sources, the highest leveraging rate ever reported by the Queensland Government. This is partly due to improved reporting, but also likely reflects the increasingly inter-disciplinary and collaborative nature of R&D and improved leveraging success.

There is still a significant opportunity for increased leveraging, particularly from the very large and relatively untapped pool of overseas sources (including universities, non-profit organisations, industry and governments), which accounted for less than 1% of leveraged funds in 2008-09 (Figure 4).

Leveraged funds were primarily sourced from industry, the Australian Government and joint/business government organisations (eg Co-operative Research Centres). Universities improved their role, accounting for 4% of R&D funds compared with 1% in 2007-08.

Figure 3: R&D expenditure by funding source, 2003-04 to 2008-09

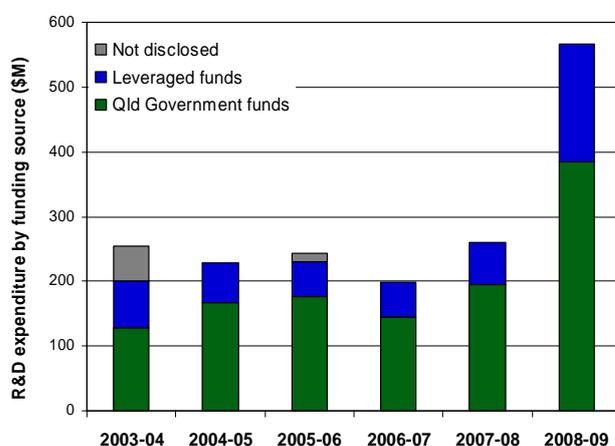
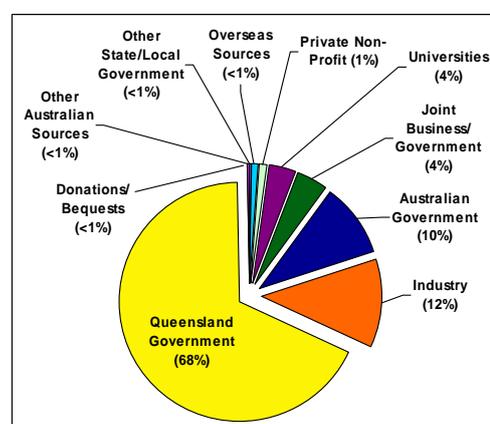


Figure 4: R&D expenditure by funding source, 2008-09



5. R&D Expenditure by location (where the R&D is undertaken)

The Queensland Government performs a significant amount of R&D in-house. However, it also takes part in collaborative projects performed both in-house and at external organisations, and commissions research to inform policy decisions. Through research grants, fellowships and infrastructure investments, the Queensland Government also supports R&D in other sectors, particularly the university and business sectors.

In 2008-09, of the \$567M invested in R&D activities (including infrastructure), \$285M was carried out in-house and \$282M was performed externally. This represents an increase of \$109M (62%) for in-house R&D and \$199M (239%) for external R&D over the previous financial year (Figure 5).

It should be stressed that most, if not all, of these increases result from one-off investments in major infrastructure projects (eg the Health and Food Sciences and Ecosciences Precincts, and the ZeroGen clean coal demonstration project) and associated leveraging of external funding.

The increase in in-house R&D expenditure was sourced solely from the Queensland Government budget, as external funding of in-house R&D actually fell 12% between 2007-08 and 2008-09 from \$53M to \$47M.

The increase in funding for external R&D was due to a \$73M (2 fold) increase in funds from the Queensland Government and a \$125M (12.6 fold) increase in funds from other sources.

Industry and universities accounted for the largest share of external R&D (Figure 6). Australian Government played an increasing role in R&D activities, accounting for 7% (up from 0.4% in 2007-08). Of 'other' R&D locations, the key players were non-profit organisations and Government-owned corporations (accounting for around \$16M and \$6M, respectively). Again, international organisations carried out only a small portion of R&D (valued around \$2M), and there is significant potential to build on overseas R&D partnerships and collaborative networks.

Figure 5: R&D expenditure by location, 2003-04 to 2008-09

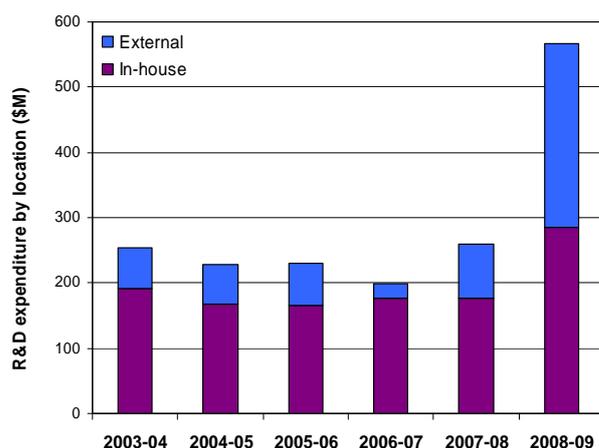
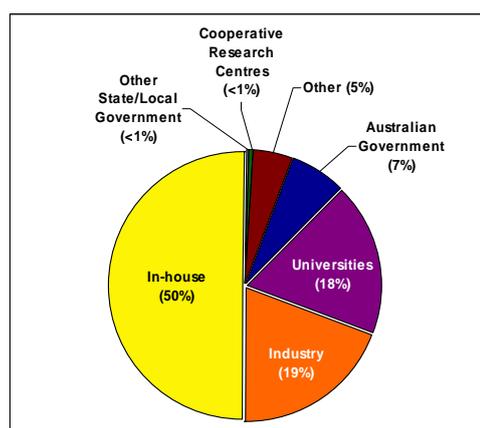


Figure 6: R&D expenditure by location, 2008-09



6. Alignment of R&D expenditure with Queensland R&D priorities

In reporting R&D expenditure, Queensland Government departments aligned each project with one or more of the six Queensland R&D priorities. The level of R&D expenditure in each priority area for 2003-04 to 2008-09 is shown in Figures 7 and 8.

Figure 7: R&D expenditure by Queensland R&D priority, 2008-09

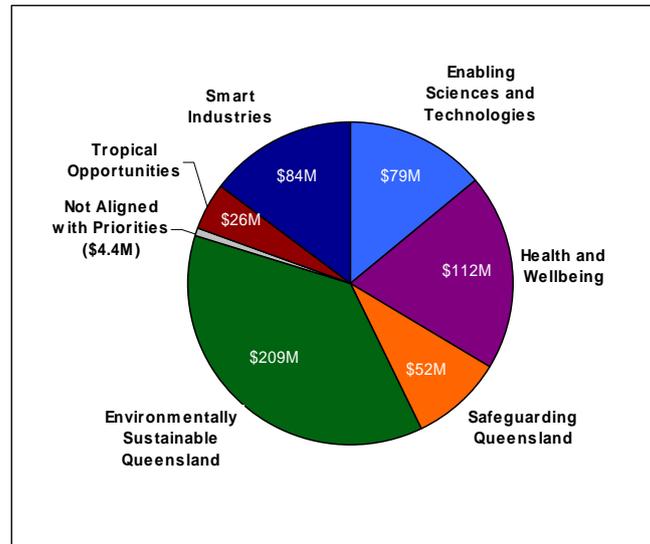
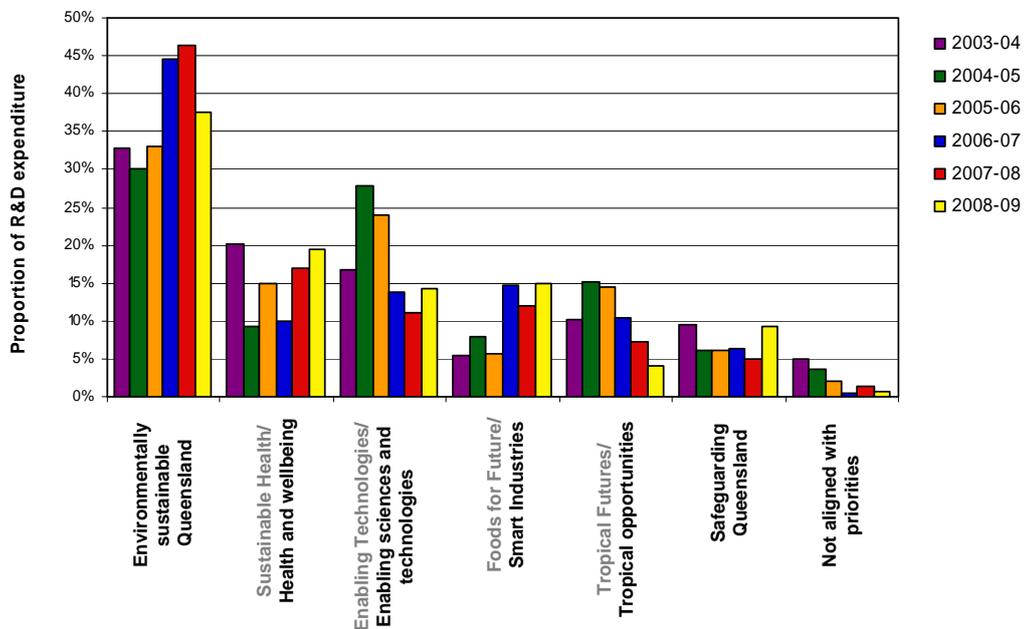


Figure 8: R&D expenditure by Queensland R&D priority, 2003-04 to 2008-09*



* Original (2003/04-2005/06) and revised (2006/07-2008/09) Queensland R&D priorities have been grouped. Environmentally sustainable Queensland and Safeguarding Queensland R&D priorities remained unchanged throughout.

Consistent with previous years, the *Environmentally sustainable Queensland* priority area attracted the largest amount of R&D funds in 2008-09 (\$209M, 37%). Key areas of R&D investment included climate change, alternative energy and clean coal, sustainable food and fibre industries, biosecurity, terrestrial and aquatic ecosystems, and water management. Financially substantial projects for 2008-09 included the Ecosciences Precinct,⁷ the ZeroGen clean coal demonstration project,⁸ the Great Barrier Reef Ocean Observing System,⁹ climate change and cloud seeding research performed by the Queensland Climate Change Centre of Excellence,¹⁰ and the Clean Energy for Remote Communities initiative.¹¹

Health and wellbeing-related R&D (\$112M, 20%) addressed areas such as medical and clinical research, emergency services, education and training, child and domestic welfare, gambling, and the wellbeing of disadvantaged groups. Major projects for 2008-09 included infrastructure investments in the Smart State Medical Research Centre¹² and the Health and Food Sciences Precinct.¹³

The *Smart Industries* priority area includes R&D that builds on the innovativeness of Queensland's established and emerging industries. This area received \$84M (15%) of R&D funding in 2008-09, a significant proportion of which went toward the areas of mining and energy, manufacturing, industrial biotechnology, food and fibre industries, rail and air transport, and workforce skilling.

The *Enabling sciences and technologies* priority area includes R&D in the fields of biology, geology, chemistry, mathematics, physics, engineering, information communication technology (ICT), nanotechnology and biotechnology. In 2008-09, \$79M (14%) of R&D funds were invested in the areas of biology/biotechnology; engineering (aerospace and roads); ICT and wireless communications; remote sensing, imaging and mapping technologies; and spatial information analysis and modelling. Substantial operational support was provided to the Institute for Molecular Bioscience,¹⁴ the Queensland Brain Institute¹⁵ and the Queensland Cyber Infrastructure Foundation.¹⁶ Other major projects included expanding the Institute for Glycomics¹⁷ and several NCRIS projects.¹⁸

The *Safeguarding Queensland* priority area addresses current and emerging threats to the safety of Queensland's communities, industries, infrastructure and environment, and accounted for \$52M (9%) of R&D expenditure in 2008-09. Key areas of investment included policing and security, defence, justice/law, biosecurity, adaptation to climate change, mining safety, road/rail safety, beach safety and occupational health and safety.

The *Tropical Opportunities* priority area includes R&D in the areas of tropical industries, infrastructure, ecosystems, communities and health. Investment in this area has decreased every financial year since 2004-05, and in 2008-09 accounted for only 5% (\$26M) of R&D expenditure, a third of its share four years ago. The vast majority of R&D in this area related to tropical food and fibre industries. Other topics included tropical diseases (diagnostics and drugs) and tropical ecosystems (rivers, coastal, rainforests and the Great Barrier Reef). R&D

⁷ <http://www.science.qld.gov.au/dsdweb/v4/apps/web/content.cfm?id=6521>

⁸ <http://www.zerogen.com.au/project/overview.aspx>

⁹ <http://imos.org.au/gbroos.html>

¹⁰ http://www.climatechange.qld.gov.au/whats_being_done/queensland/queensland_climate_change_centre_of_excellence

¹¹ http://www.climatechange.qld.gov.au/_data/assets/pdf_file/0003/25617/1_Energy_-_B2_web.pdf

¹² <http://www.gimr.edu.au/news/2009/articles/watpac.html>

¹³ <http://www.science.qld.gov.au/dsdweb/v4/apps/web/content.cfm?id=6522>

¹⁴ <http://www.science.qld.gov.au/dsdweb/v4/apps/web/content.cfm?id=6522>

¹⁵ <http://www.qbi.uq.edu.au/>

¹⁶ <http://www.qcif.edu.au/>

¹⁷ <http://www.griffith.edu.au/science/institute-glycomics>

¹⁸ <http://ncris.innovation.gov.au/Pages/default.aspx>

related to *Tropical Opportunities* is expected to increase next financial year with the planned roll out of a \$19M commitment to the \$50M Queensland Tropical Health Alliance.¹⁹

7. Future R&D expenditure reporting

Improvements in R&D expenditure reporting for 2008-09

There have been significant improvements in the reporting of R&D expenditure by Queensland Government departments in 2008-09:

- Whereas R&D expenditure was previously provided at the program level by several departments, in 2008-09, all departments provided data at the project level. This list of R&D projects will form the basis of a new R&D project database, aimed at improving the sharing of R&D information between Queensland Government departments.
- Several departments have, or are in the process of, developing their own databases/repositories of R&D projects, making the reporting of R&D expenditure data more simple and accurate.
- Overall, departments were much more comprehensive in their reporting of leveraged R&D funds. This is responsible, at least in part, for the increased leveraging rate in 2008-09.
- In an attempt to rectify past discrepancies between the in-house portion of Queensland Government R&D expenditure reported through this report and that reported by the Australian Bureau of Statistics, several departments prepared data for both concurrently.

Future developments for R&D expenditure reporting

R&D Queensland is a whole-of-Government committee tasked with ensuring that R&D activities of Queensland Government agencies are integrated with the Government's *Toward Q2* strategy, and that outcomes from R&D investments are maximised.

As part of this role, R&D Queensland in collaboration with the Office of the Queensland Chief Scientist and departmental representatives has developed the *Queensland R&D Investment Strategy 2010-2020*. This includes supplementing the six Queensland R&D Priorities with 14 R&D objectives. Consequently, there will be several changes in R&D reporting in future:

- R&D expenditure will be aligned with the 14 new R&D objectives within the six Queensland R&D Priorities.
- Departments will no longer be required to provide information on key performance indicators and outcomes for each project. Much of the information currently reported refers to *expected* rather than *actual* outcomes, limiting its value in measuring performance. Instead, outcomes of R&D will be reported at a higher level through a range of key performance indicators. These indicators will form part of the annual progress report for the *Queensland R&D Investment Strategy 2010-2020*, to be prepared by R&D Queensland with the Office of the Queensland Chief Scientist.

¹⁹ <http://statements.cabinet.qld.gov.au/mms/statementdisplaysingle.aspx?id=61099>