



# Queensland Government research and development expenditure report 2009-10

Compiled by the Office of the Queensland Chief Scientist

*Based on information supplied by Queensland Government departments on their research and development expenditure for the 2009-10 financial year. The Office of the Queensland Chief Scientist would like to thank departmental staff for their continued collaboration in collecting research and development data.*

# 1. Purpose of report

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## 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. R&D also provides a means to capitalise on our natural and intellectual resources and convert them into economic outcomes for the State.

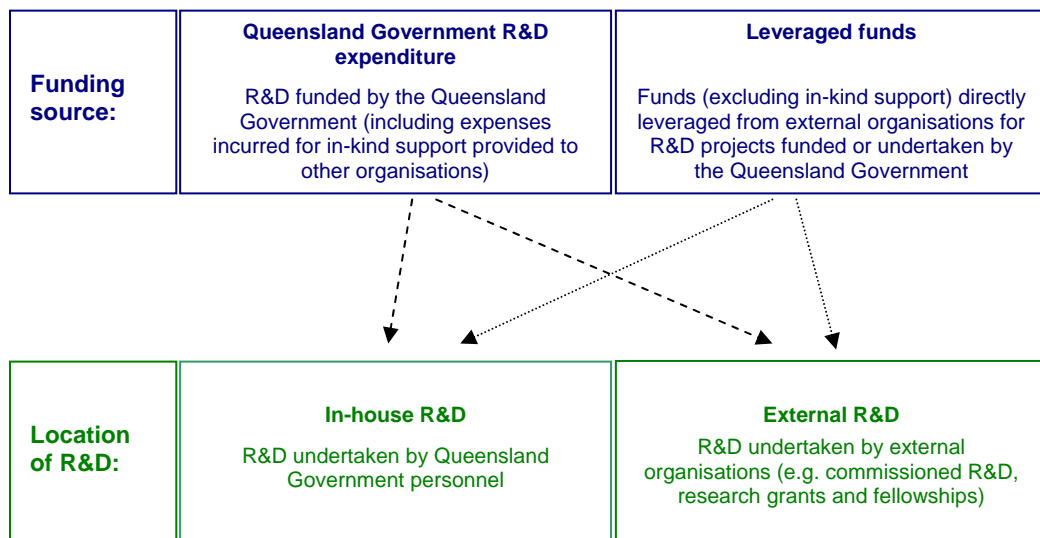
The Queensland Government is involved in R&D in several ways:

- undertaking in-house R&D– to guide policy decisions and underpin service delivery
- commissioning research – to inform policy and decision making
- facilitating research – through grants, fellowships, infrastructure and a range of initiatives that support Queensland's higher education and business R&D.

## Scope

This report provides financial information on the R&D investments of the Queensland Government, and funds these investments have leveraged from external sources, for the 2009-10 financial year (see Figure 1).

**Figure 1: Breakdown of R&D expenditure included in the report<sup>1</sup>**



<sup>1</sup> Queensland Government R&D expenditure reported here differs from that reported by the Australian Bureau of Statistics, which refers solely to Queensland Government 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 provided the funding
- the breakdown of R&D by location i.e. the sector performing the R&D
- the alignment of R&D expenditure across the 14 Queensland R&D objectives (see Table 1).

**Table 1: Queensland R&D priorities and objectives<sup>2</sup>**

Queensland R&D priorities	Queensland R&D objectives	
<b>Enabling sciences &amp; technologies</b>	Enabling sciences & technologies	<ul style="list-style-type: none"> <li>• <i>support development of capabilities in the enabling sciences and technologies</i></li> </ul>
<b>Environmentally sustainable Queensland</b>	Ecosystems	<ul style="list-style-type: none"> <li>• <i>protect and restore Queensland's diverse ecosystems</i></li> </ul>
	Land	<ul style="list-style-type: none"> <li>• <i>sustain and restore Queensland's land and soil</i></li> </ul>
	Atmosphere	<ul style="list-style-type: none"> <li>• <i>mitigate air pollution and adapt to climate change</i></li> </ul>
	Water	<ul style="list-style-type: none"> <li>• <i>ensure a sustainable balance between water demand and supply</i></li> </ul>
<b>Smart industries</b>	Industry development	<ul style="list-style-type: none"> <li>• <i>build Queensland's knowledge-intensive industries</i></li> </ul>
	Food & fibre industries	<ul style="list-style-type: none"> <li>• <i>enhance productivity and create new value-adding products and services in Queensland's food and fibre industries</i></li> </ul>
	Energy & resources industries	<ul style="list-style-type: none"> <li>• <i>support safe, sustainable and competitive energy and resources industries</i></li> </ul>
	Infrastructure, planning & services	<ul style="list-style-type: none"> <li>• <i>plan for and deliver cost-effective, efficient infrastructure and services</i></li> </ul>
<b>Tropical opportunities</b>	Tropical opportunities	<ul style="list-style-type: none"> <li>• <i>create globally competitive tropical expertise industries</i></li> </ul>
<b>Health &amp; wellbeing</b>	Health	<ul style="list-style-type: none"> <li>• <i>prevent disease and deliver top quality patient care at sustainable cost</i></li> </ul>
	Community wellbeing	<ul style="list-style-type: none"> <li>• <i>identify and address the causes of disadvantage and better integrate the delivery of community services</i></li> </ul>
	Education & training	<ul style="list-style-type: none"> <li>• <i>underpin quality education and training for all Queenslanders</i></li> </ul>
<b>Safeguarding Queensland</b>	Safeguarding Queensland	<ul style="list-style-type: none"> <li>• <i>manage and prevent crime, biosecurity threats and natural and non-natural disasters</i></li> </ul>

<sup>2</sup> A profile for each Queensland R&D objective can be found in the [Queensland research and development investment strategy 2010-2020](#).

## 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.*<sup>3</sup>

It does not include science activities such as routine monitoring and data collection, quality control, or scientific and technical services. Several Queensland Government departments, such as the Department of Environment and Resource Management, undertake various science activities as part of their core business which do not adhere to the above R&D definition, and so are not captured in this report. The R&D definition also excludes market research, operations research or statistical analyses, routine computer programming, and the extension or commercialisation of R&D.

R&D expenditure refers to monies expended, not monies committed, in the 2009-10 financial year. It includes capital expenditure, such as the acquisition of land, buildings and equipment, and current expenditure, including salaries, consumables and operating expenses.

## Data collection

R&D expenditure data are provided to the Office of the Queensland Chief Scientist by each of the Queensland Government's 13 departments, as well as the Queensland Museum. Data are not collected from Government-owned corporations.

All but the Department of Infrastructure and Planning (DIP) reported R&D expenditure for 2009-10. However, DIP plays a key role in Queensland's R&D through planning and facilitating the provision of R&D precincts and infrastructure throughout Queensland.

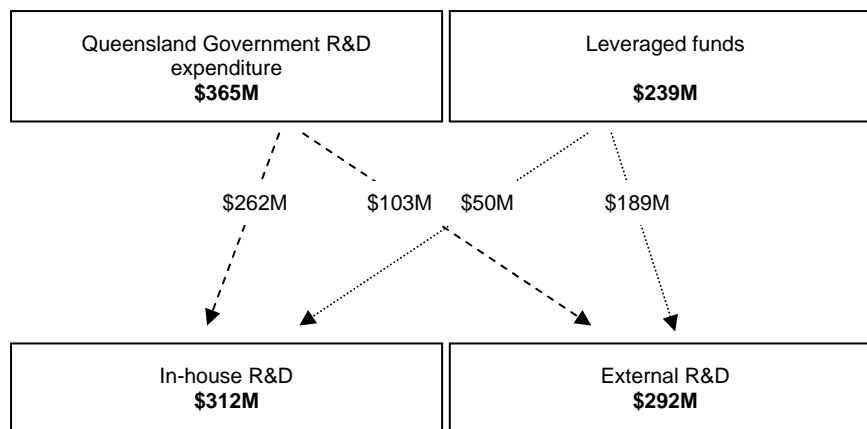
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<sup>3</sup> *Frascati Manual 2002: Proposed Standard Practice for Surveys on Research and Experimental Development*, OECD, Paris, 2002.

## 2. Snapshot of R&D expenditure 2009-10

- In 2009-10, the Queensland Government invested **\$365M** in R&D,<sup>4</sup> down slightly (\$19M, 5 per cent) compared with 2008-09.
- This included a **\$163M investment in R&D infrastructure**, \$158M of which went towards the construction of the Health and Food Sciences and Ecosciences Precincts.
- The Queensland Government provided **\$103M** in R&D funds to external organisations in 2009-10, down **\$43M (30 per cent)** compared with 2008-09.
- Over **70 per cent (\$262M)** of the Queensland Government's R&D investment went towards **in-house R&D**, an increase of \$23M (10 per cent) compared with 2008-09.
- For every **\$1.00** invested in R&D by the Queensland Government, **\$0.66** was leveraged from external sources, resulting in \$239M in leveraged funds, up \$56M on 2008-09 levels.
- Of the 14 Queensland R&D objectives, the **energy and resources industries and the health objectives received the largest allocation of funds** – 19 per cent and 18 per cent of total R&D expenditure (including leveraged funds), respectively.
- The **education and training R&D objective received the least funds** (less than 1 per cent of total R&D expenditure).

Figure 2: Total R&D expenditure 2009-10



<sup>4</sup> The definition of Queensland Government R&D expenditure has been altered since the last report to only include monies expended by the Queensland Government, not funds leveraged from external organisations. This was referred to as the 'Queensland Government R&D budget' in previous reports. Previous years' values have been updated accordingly.

### 3. 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.

In 2009-10, the Queensland Government expended \$365M on R&D, including just over \$163M on infrastructure and \$201M in current expenditure. The substantial increase in R&D expenditure in 2008-09 and 2009-10 over previous years (Figure 3) was in part due to the roll out of large infrastructure projects such as the Ecosciences and Health and Food Sciences Precincts, both completed in 2010.

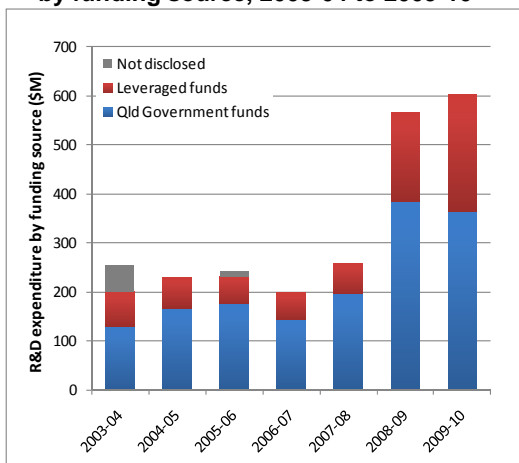
For every \$1.00 invested by the Queensland Government in R&D in 2009-10, \$0.66 was leveraged from external sources, resulting in a total of \$239M of leveraged funds. This is an increase of \$56M (31 per cent) compared with 2008-09 levels, despite a slight (5 per cent) decrease in the Queensland Government's investment in R&D in 2009-10.

This is the highest leveraging rate ever reported by the Queensland Government and reflects the increasingly inter-disciplinary and collaborative nature of R&D and improved leveraging success.

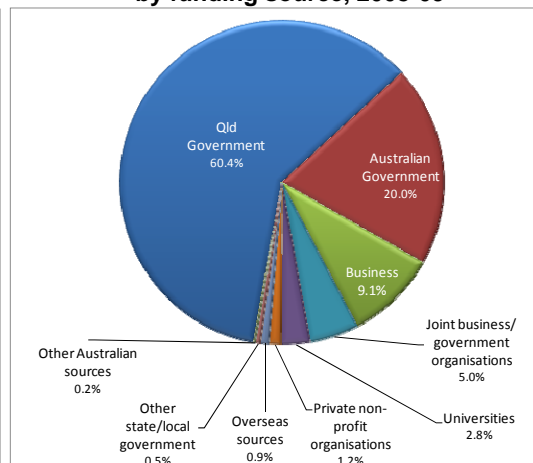
Leveraging performance was particularly strong in the areas of health R&D (\$0.92 for every \$1.00 invested) and R&D related to the energy and resource industries (\$1.64 for every \$1.00 invested), the latter due primarily to the contribution of \$67M by partners into low emissions coal technology projects.

Leveraged funds were primarily sourced from the Australian Government (20 per cent, up from 10 per cent in 2008-09), including \$48.6M from CSIRO towards the Health and Food Sciences and Ecosciences Precincts, and industry (Figure 4).

**Figure 3: Total R&D expenditure by funding source, 2003-04 to 2009-10\***



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



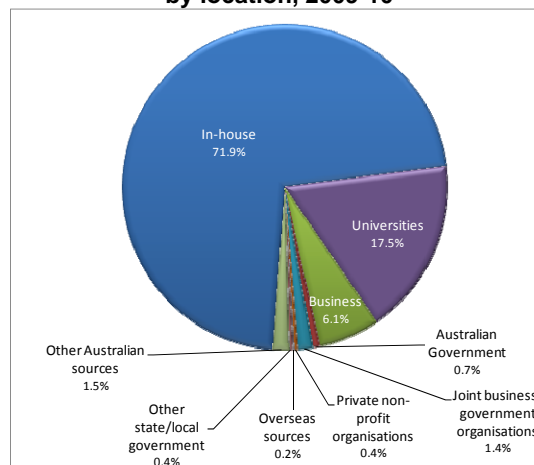
\* Includes Queensland Government R&D expenditure and leveraged funds.

## 4. R&D expenditure by location (the sector performing the R&D)

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 with 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.

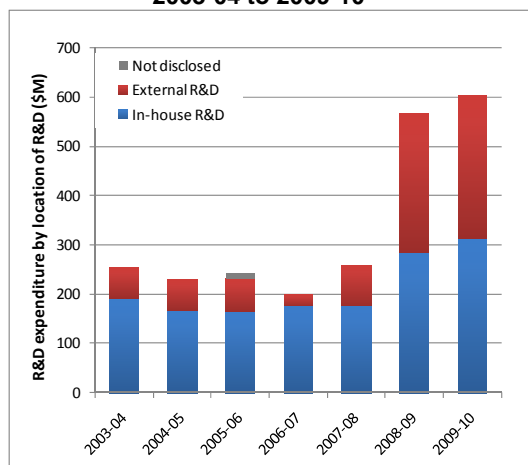
In 2009-10, there was an increased investment by the Queensland Government in in-house R&D, with 72 per cent (\$262M) of investments going towards in-house R&D, and just 28 per cent (\$103M) towards R&D performed by external organisations (Figure 5). This represents an increase of \$23M towards in-house R&D and a decrease of \$43M towards external R&D compared with 2008-09. Universities received the greatest Queensland Government funds.

**Figure 5: Queensland Government R&D expenditure by location, 2009-10**

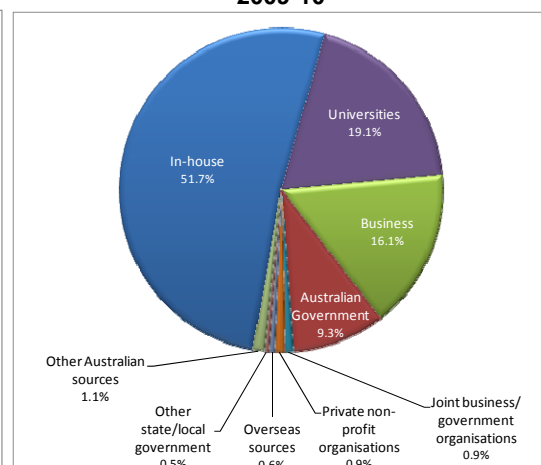


Due to the increase in funds leveraged from external organisations in 2009-10 (79 per cent for projects external to Government), overall, there was little change in the proportion of total R&D investments in in-house versus external R&D (Figure 6).<sup>5</sup> In-house R&D accounted for 52 per cent (\$312M) of total R&D expenditure from all sources, and external R&D for 48 per cent (\$292M). Consistent with 2008-09, universities and industry accounted for the largest share of external R&D, followed by the Australian Government (Figure 7).

**Figure 6: Total R&D expenditure by location, 2003-04 to 2009-10\***



**Figure 7: Total R&D expenditure by location, 2009-10\***



\* Includes Queensland Government R&D expenditure and leveraged funds.

<sup>5</sup> The large increase in funding of external R&D in 2008-09 compared with earlier years was due to a \$73M increase in funds from the Queensland Government (including \$45M towards low emissions coal technology projects) and a \$125M increase in funds from external sources.

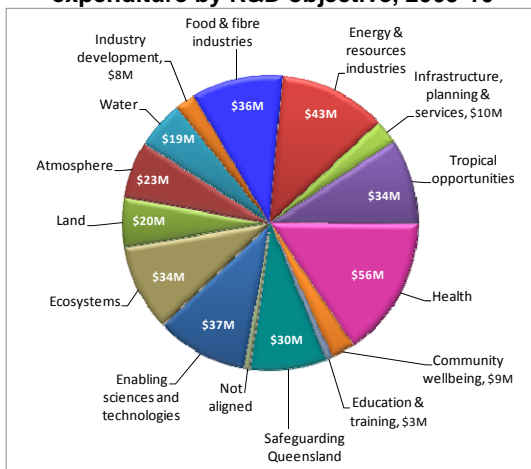
## 5. Alignment of R&D expenditure with the Queensland R&D objectives

### Proportion of R&D expenditure aligned with each R&D objective

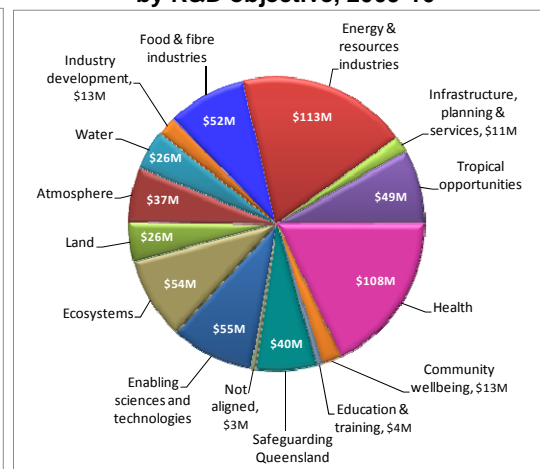
In 2010, the Queensland Government released the *Queensland research and development investment strategy 2010-2020*, an overarching framework to guide Queensland Government R&D investments. It articulated 14 R&D objectives to focus the government's investment in R&D (see Table 1).

As a result, from this year, R&D expenditure has been aligned with the 14 Queensland R&D objectives. In cases where an R&D project was relevant to two or more R&D objectives, its expenditure was apportioned between the relevant objectives so that the proportion of Queensland Government R&D funds (and total R&D funds) invested in each objective area could be estimated (Figures 8 and 9).

**Figure 8: Queensland Government R&D expenditure by R&D objective, 2009-10**



**Figure 9: Total R&D expenditure by R&D objective, 2009-10\***



\* Includes Queensland Government R&D expenditure and leveraged funds.

Given the importance of each of the 14 R&D objectives, it is of interest to examine the balance of expenditure between them.

In the case of the objectives relating to an environmentally sustainable Queensland, there appears to be a good balance between investments in land, water, atmosphere and ecosystems research, with significant leveraging of external funding also occurring in each of these objective areas.

In the economic space, the vast majority of Queensland Government R&D expenditure was in the traditional food and fibre and energy and resources industries, helping to maintain the technological sophistication of these industries in Queensland (and Australia).

In comparison, there was relatively less expenditure in the Industry Development objective.<sup>6</sup> This has implications for the future diversification of Queensland's economy. It is noted, however, that this situation is partly alleviated by strong investment in enabling sciences and technologies, as well as an industry component in Tropical Opportunities investments.

<sup>6</sup> The Industry Development objective captures industries outside of the food and fibre industries, energy and resources industries, and health and medical industries, which are captured under their respective R&D objectives. The Health R&D objective (including industry and non-industry related R&D) also received substantial R&D investments in 2009-10.



Among the social objectives, Health and Safeguarding Queensland are both strong areas of investment, but Community Wellbeing, and particularly Education and Training, have attracted relatively small amounts of Queensland Government or leveraged funding.

### Total value of projects related to each R&D objective

In the above analysis, the expenditure on projects relevant to more than one R&D objective was divided between objectives. However, just because a project is relevant to more than one R&D objective does not mean that its contribution to achieving each of those objectives is diminished. A project relevant to more than one objective has a multiplier effect rather than a diminished impact on each objective (e.g. a solar energy R&D project does not have a lesser contribution to the energy and mining sector just because it also reduces greenhouse gases and thus contributes to the atmosphere R&D objective).

Therefore, to get a sense of the overall R&D investment by the Queensland Government towards each R&D objective, Table 2 gives the total value of all projects related to each R&D objective (Queensland Government expenditure excluding leveraged funds), assuming that the total value of each project can be assigned to each relevant R&D objective. It should be noted that, consequently, the sum of these values will be vastly greater than the Queensland Government investment in R&D.

**Table 2: Queensland Government R&D expenditure – overall investment towards each R&D objective**

Queensland R&D objective	\$M
Ecosystems	209.1
Tropical opportunities	208.1
Health	202.8
Safeguarding Queensland	199.6
Food & fibre industries	195.2
Energy & resources industries	190.0
Land	185.7
Atmosphere	181.8
Water	166.3
Enabling sciences & technologies	81.5
Industry development	29.4
Community wellbeing	10.8
Infrastructure, planning & services	9.8
Education & training	3.4

Table 2 gives a slightly different picture of the balance of R&D investments than Figure 8. For example, R&D expenditure on Tropical opportunities (rated second in Table 2) included a substantial amount related to Queensland's tropical food and fibre industries and tropical ecosystems, resulting in a lower rating for the Tropical opportunities objective in Figure 8 because expenditure on these projects was also divided between the Ecosystems and Food & fibre industries objectives. Similarly, a fair portion of Ecosystems R&D expenditure was also apportioned to the Tropical opportunities and/or Atmosphere objectives (e.g. R&D projects on the effect of climate change on the Great Barrier Reef) in Figure 8, explaining its lower rating there compared with Table 2.

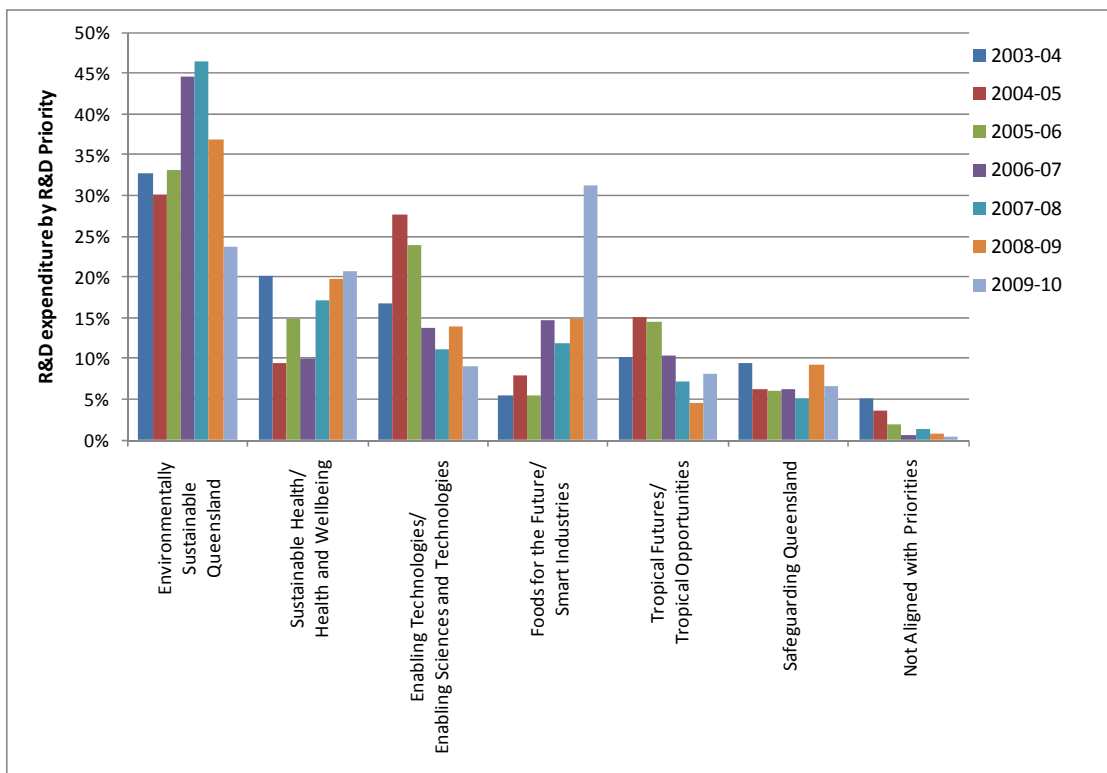
## Alignment of R&D expenditure with the Queensland R&D priorities over time

Each of the 14 Queensland R&D objectives aligns with one of six Queensland R&D priorities (see Table 1). R&D expenditure has been aligned with the Queensland R&D priorities since 2003-04, allowing for the analysis of trends (Figure 10).

In 2009-10, the proportion of R&D expenditure related to the Smart Industries R&D priority (including food and fibre, energy and resources, infrastructure and other industries) more than doubled (increasing from 15 per cent to 31 per cent) compared with 2008-09. This correlated with a decrease in the proportion of R&D aligned with the Environmentally Sustainable Queensland objective from 37 per cent to 24 per cent.

At this stage, it is difficult to determine whether these represent real changes in the focus of R&D investments or whether they are an artefact of changes in reporting against the 14 new R&D objectives in 2009-10.

Figure 10: R&D Expenditure by Queensland R&D priority, 2003-04 to 2008-09\*<sup>#</sup>



\* Includes Queensland Government R&D expenditure and leveraged funds.

<sup>#</sup> Original (2003/04-2005/06) and revised (2006/07-2009/10) Queensland R&D priorities have been grouped as appropriate. Environmentally Sustainable Queensland and Safeguarding Queensland R&D priorities remained unchanged throughout.

## 6. Conclusions

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The sharp increase in R&D expenditure by the Queensland Government in 2008-09 has been maintained in 2009-10, primarily due to the \$158M towards the construction of the Health and Food Sciences and Ecosciences Precincts.

This has been accompanied by a further, and very significant, increase in leveraged funding to the highest leveraging rate yet achieved by the Queensland Government. Much of this increase has again been directed to external R&D.

The 2009-10 Queensland Government R&D Expenditure Report is the first to align R&D expenditure using the 14 Queensland R&D objectives outlined in the *Queensland research and development investment strategy 2010-2020*.

This analysis revealed strong spending across most R&D objectives, though two areas warrant ongoing attention:

- low spending on industry development (\$13M) relative to food and fibre industries (\$52M) and energy and resources industries (\$113M) suggests an imbalance between traditional resource-based industries and emerging knowledge-intensive industries
- low spending on community wellbeing and education and training R&D may hinder the achievement of the government's Q2 ambition of a fair and smart Queensland.