

**State Expenditure on
Science & Technology and
Research & Development
2004 and 2005**

Science and Technology Budget

Review of State Expenditure on Science & Technology and Research & Development 2004 and 2005

Incorporating financial expenditures in 2004 and allocations for 2005 by government to institutions engaged in any activity related to science, technology, research and development.

Prepared by:

Science and Technology Indicators Unit

Monica Roche

Andrew Stockman

Helena Connellan

Alison Brereton

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Foreword

Investment in science and technology (S&T), particularly in research and development (R&D) activities, is one of the key pillars of policy under the National Development Plan, which helps drive the Irish economy in its transition to become a more knowledge-driven economy with high value-added activities.

Government departments and agencies have a key role in carrying out and supporting science and technology spending. The largest areas of State expenditure on science and technology identified in this report are:

- ▶ *Supporting R&D performed in the government sector;*
- ▶ *Assisting businesses that carry out S&T activities;*
- ▶ *Supporting S&T infrastructure;*
- ▶ *Promoting S&T across the education and training systems.*

In an ever-evolving and more competitive global economic environment, the Irish economy is already beginning to reap the benefits of previous S&T investments from private and public sources. This increased investment in innovation has helped foster more research and development which is in turn being successfully exploited in commercial terms by Irish-based firms in markets across the world.

Looking to the future, the drive to become a truly knowledge-driven and competitive economy can only become more difficult as globalisation increases, firm-level collaboration increases across major competitors and as markets become even more open to trade and more price competitive. Investment in science, technology and innovation will assist firms to stay one step ahead of their global competitors by allowing development and delivery of new products, processes and solutions to markets.

Therefore the role of government in investing in key science and technology areas will remain critical over the coming years. The Irish government must therefore continue the positive trends of previous years, by continuing to place investment in S&T high on its priority list of economic spending. In particular, increasing R&D spending, and improving R&D performance, is one of the key drivers identified which will support efforts to move to a more knowledge-driven and competitive economy. The increased complexity and technology content of most activities offers significant opportunities for innovation-based solutions to complex problems. Therefore the development and delivery of new products and innovative processes to meet market needs, will place firms in a stronger position compared to major competitors.

If you require further information about this survey please contact:

Andrew Stockman
Science and Technology Indicators Unit
Forfás
Wilton Park House
Wilton Place
Dublin 2
Ireland
Tel: 01 607 3224
www.forfas.ie



Contents

Introduction	2
Government Departments and Agencies	3
Definitions of Science and Technology Activities	4
Chapter 1 – Science and Technology	5
1.1 Total State funding of S&T	5
1.2 Funding for S&T in the State sector	6
1.3 Sources of funding for S&T in the State sector, 1995-2005	7
1.4 Public Funding of S&T as a % of GNP	8
1.5 Trends in S&T spending by activity, 2002-2005	9
1.6 S&T funding by activity, 2005	10
1.7 Indicative distribution of government funds for S&T, 2005	11
Chapter 2 – Research and Development	12
2.1 Total State funding of scientific R&D	12
2.2 Total public funding of scientific R&D	14
2.3 Sources of public funding for scientific R&D	15
2.4 Public funding of R&D by departments and offices	16
2.5 Government budget allocations as a % of GNP	18
Chapter 3 – Performance of R&D in the Public Sector	19
3.1 Expenditure on R&D performed in the public sector, 1995-2005	19
3.2 Performance of R&D in the public sector as a % of GNP	20
3.3 Major performers of R&D in the public sector	21
Chapter 4 – Personnel Engaged in R&D	22
4.1 Researchers and research personnel in the State sector	22
4.2 Full-time equivalents devoted to R&D by gender	23
4.3 R&D personnel by qualification	25
Chapter 5 – International Comparisons of Public Sector R&D	27
5.1 Government budget allocated to R&D as a % of GDP	27
5.2 Civil R&D funding by the government sector for selected countries, 1995 and 2004	28
5.3 R&D performance within the government sector for selected countries, 1995 and 2004	29
5.4 Average annual growth of government R&D budget	30
Forfás Publications 2005	31
Functions of Forfás	32
Forfás Board Members	33
Appendices:	
Appendix 1: Methodology	34
Appendix 2: Index of Acronyms	35
Appendix 3: Transfer Payments Between Departments and Agencies	36
Appendix 4: Departments' and Agencies' Programmes	(Attached CD-ROM)

Introduction

Every year Forfás publishes the 'Science and Technology Budget', a comprehensive report on State expenditures on science and technology (S&T) and research and development. The 'Science and Technology Budget' provides details of the allocations made by Government to all scientific and technological activities, both those undertaken by the public sector and the private sector. The most important of these activities is research and development (R&D). Other activities include training, education and information, technical services (including information and advice) and technology transfer. In all, 46 government departments and agencies are involved in allocating the total S&T budget.

This publication provides details on allocated and actual spending by the State on science and technology (S&T) activities in the period 2004-2005. It includes the final outturn of spending on S&T activity by the State in 2004, alongside proposed spending by the State on S&T in 2005.

As well as examining the overall levels of State spending on S&T, the report measures spending as a proportion of economic activity and of the total government budget. The report also details the S&T activities of individual departments and agencies, changes in spending, and S&T spending by purpose and objective.

The publication also focuses on State spending on research and development. It includes the final outturn of spending on R&D activity by the State in 2004, alongside proposed spending by the State on R&D in 2005.

Government Departments and Agencies

Spending by the State on S&T includes:

- *S&T spending by government departments;*
- *S&T spending by associated government agencies;*
- *S&T spending by government offices.*

Table 1 below is a list of 46 government departments, agencies and offices which are included in the 2004/2005 science budget.

Table 1: *Government departments/agencies funding S&T, 2005*

Departments	Agencies	Departments	Agencies
Agriculture & Food	Teagasc	Enterprise, Trade & Employment	Enterprise Ireland
Arts, Sport and Tourism			FÁS
Transport	National Roads Authority		Forfás
Communications, Marine and Natural Resources	Bord Iascaigh Mhara Central & Regional Fisheries Board COFORD Dept. of Communications, Marine and Natural Resources Marine Institute Sustainable Energy Ireland		IDA Ireland
		National Microelectronics Application Centre	
		National Standards Authority of Ireland	
		Science Foundation Ireland	
		Finance	Economic & Social Research Institute
Community, Rural & Gaeltacht Affairs	Údarás na Gaeltachta	Health and Children	Food Safety Authority Health Research Board Postgraduate Medical & Dental Board
Education and Science	Dublin Institute for Advanced Studies HEA Irish Research Council for Humanities and Social Sciences Irish Research Council for Science, Engineering and Technology	Social and Family Affairs	
		Environment, Heritage & Local Government	Environmental Protection Agency Met Éireann Radiological Protection Institute of Ireland
OFFICES	Central Statistics Office Central Bank Office of Public Works State Laboratory Ordnance Survey Ireland	Taoiseach	National Economic & Social Council

Definitions of Science and Technology Activities

The total public expenditure on science and technology occurs under five broad headings. These are classified below with a detailed definition of each.

i) Research and development:

- ▶ **Research:** *Original, experimental or theoretical investigations undertaken to acquire new knowledge, with or without a particular application or use in view.*
- ▶ **Development:** *Systematic work drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new products, processes, systems, services, varieties and breeds and to improving substantially already existing ones. Data collection conducted solely or primarily as part of the research and development (R&D) process included under "research" or "development" as appropriate.*

ii) **Technical services:** Specialised support services of a scientific or technical nature generally provided by centralised laboratories or facilities and can be of a routine or non-routine nature. Essentially they comprise the technical back-up, analytical, diagnostic and data collection/processing services.

iii) Training, education and information:

- ▶ **Training and education:** *Education and training of third level or equivalent students in science and technology disciplines.*
- ▶ **Information:** *Provision of information via **formalised scientific and technical information and documentation (STID) services** includes all expenditure (manpower and materials) involved in acquiring, controlling or transmitting information to users with the involvement of staff whose primary function is in formalised STID services e.g. provision of S&T information, advice, liaison, specialist advice, information analysis, libraries, publications and documentation services, translations, technical seminars and conferences. Provision of information via **non-formalised STID services** includes expenditure on providing know how and expertise by members of staff who, while not specifically engaged in formalised STID services, provide specialist advice, liaison, consultancy or other general information services.*

iv) **Technology transfer:** Activities which are directed solely or primarily towards the transfer and adoption of new technology, generally in enterprises. The horizontal transfer of technology, primarily from abroad, but also from colleges to enterprises is included here.

v) **Other S&T activities:** Activities which cannot be conveniently grouped under the above headings can be included here e.g. grants to international organisations, policy planning units etc.

Other definitions:

- ▶ **Third level education:** *All universities and institutes of technology.*
- ▶ **Public funds:** *Exchequer monies and funds from the EU.*
- ▶ **Extramural expenditure:** *Monies spent on S&T activities carried out on behalf of the reporting institution by a third party.*

1 Science and Technology

1.1 Total State funding of science and technology

The total State funding of science and technology (S&T) activities from 46 government departments, agencies and offices increased by 9.7% between 2003 and 2004, from €1.88 billion to €2.06 billion (Table 2). Total State funding of S&T includes expenditure by the exchequer, expenditure by the EU and finally receipts from the earned income of activities. State funding is estimated to have risen by a further 6.5% in 2005 to total €2.20 billion.

The largest contributor to the overall State S&T budget in 2004 was the exchequer, which accounts for over 86% of the total spend. Exchequer funding for science and technology activities, which includes expenditure on research and development and education and training activities among others, increased by €130.5 million (7.9%) compared to 2003, to total €1.78 billion in the outturn for 2004.

Earned income from science and technology activities increased by over 14% from the 2003 outturn to total €239 million in 2004. Finally the contribution from the EU via structural funds increased to €46.1 million in 2004.

Table 2: Total State funding of S&T, 2003 outturn, 2004 outturn and 2005 allocation €m.

	2003 Outturn	2004 Outturn	2005 Allocation
Exchequer funds	1,645.51	1,775.99	1,919.96
EU contribution	22.90	46.10	39.93
Total public funds	1,668.41	1,822.09	1,959.90
Earned income	208.55	238.65	234.89
Total	1,876.96	2,060.74	2,194.79

The 2005 Science Budget, as well as collecting final data for 2004, also captured data from government departments, offices and agencies on estimated spending on S&T activities in 2005. These estimates are made following the allocations to departments outlined in the 2005 budget.

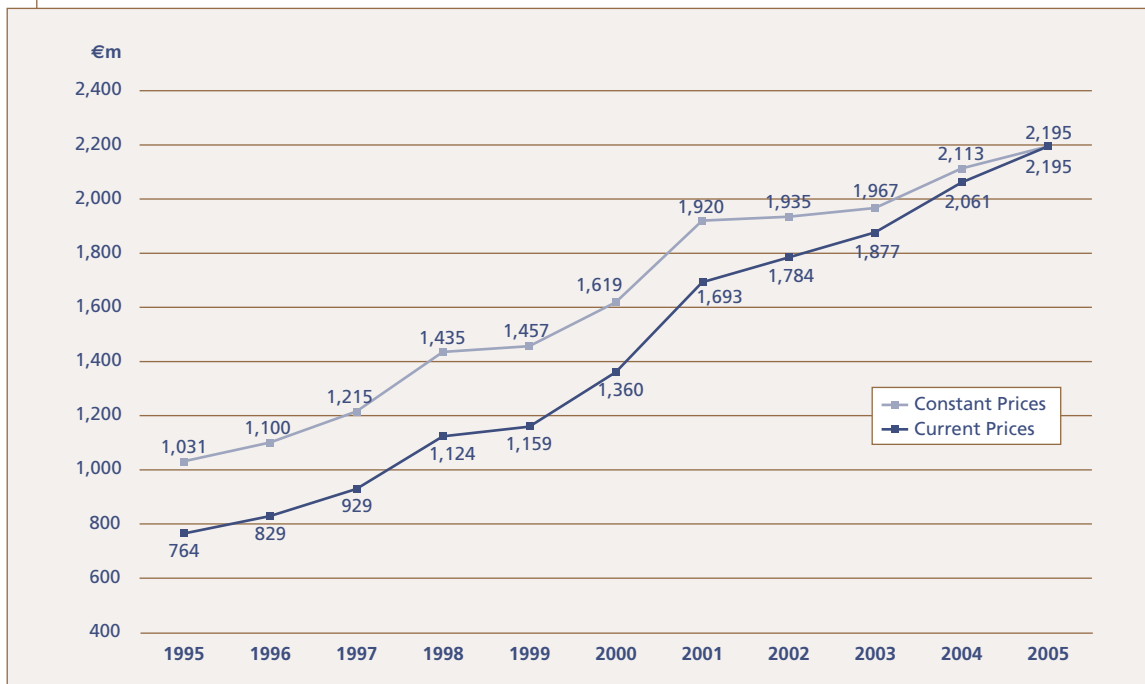
Preliminary data shows that State expenditure allocated to science and technology activities is expected to rise to €2.2 billion in 2005. Although data is subject to final confirmation, this would result in a deceleration in the rate of State spending growth for science and technology activities to 6.5% between 2004 and 2005. The exchequer allocated part of total spending is expected to increase by 8.1% in 2005, slightly ahead of the 7.9% exchequer funded growth in 2004.

1.2 Funding for science and technology in the State sector

Figure 1 shows the increase in funding of science and technology in the State sector in the ten year period between 1995 and 2005. The two lines show spending in nominal terms (€m) and also in real terms (data is deflated by the consumer price index to eliminate the effects of inflation and price rises on the data).

The graph shows that funding for S&T activities has increased steadily between 1995 and 2005 in current prices (lower line). Between 1995 and 2000, the rate of increase in S&T spending was 78%. That rate of increase slowed between 2000 and 2005 to 61%. The rate of expansion in State expenditure allocated to S&T activities between 2004 and 2005 is expected to slow to 6.5%, compared to the 9.8% rise posted between 2003 and 2004.

Figure 1: Funding for science and technology in the State sector (real and nominal) (€m)



When we examine the data in constant prices (higher positioned line), which strips out the effects of inflation on the data, we see that State spending on S&T slowed markedly between 2001 and 2003. This was a result of the deceleration in nominal spending growth following a two-year period of record increases in S&T spending and also as a result of a period of high inflation which averaged over 5% per annum and which eroded the real gains from the S&T spending increases. As nominal spending growth quickened once more in 2004, and inflationary pressures eased, real spending growth in S&T was also able to accelerate once more to 7.4%. Initial estimates for 2005 point to an easing in real spending growth in S&T once more, to 3.9%.

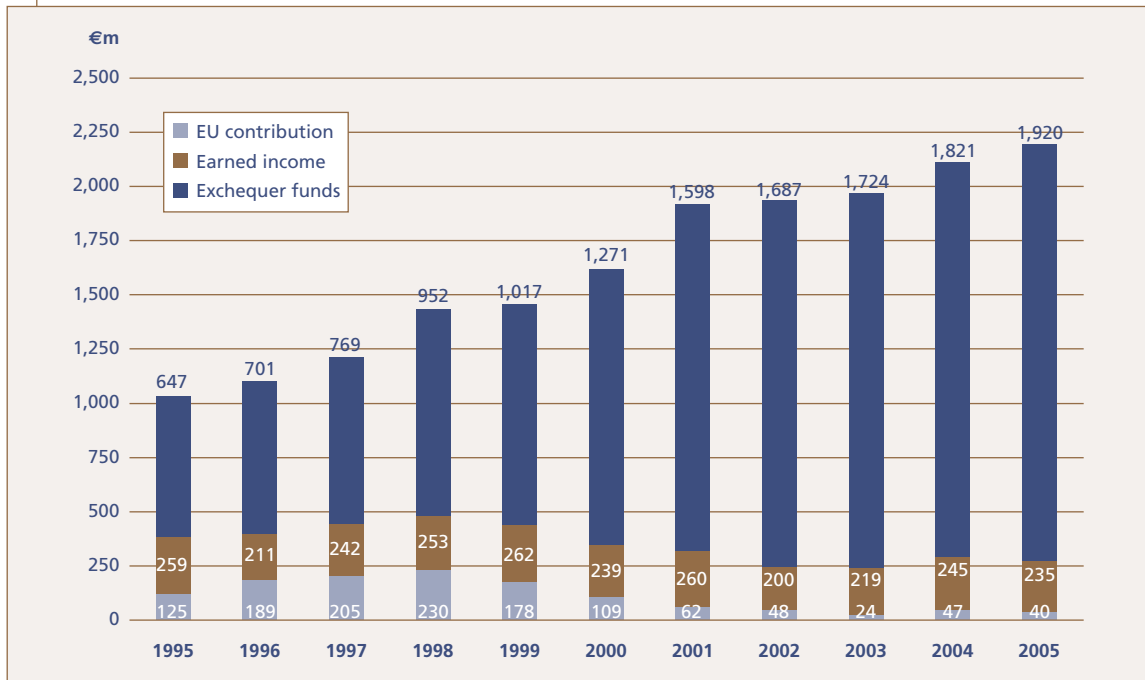
1.3 Sources of funding for science and technology in the State sector 1995-2005

Funding for science and technology in the State sector (fig. 2) comes from the following sources:

- ▶ *Direct exchequer funds*
- ▶ *EU contributions*
- ▶ *Earned income (mostly from fees received by the HEA).*

The breakdown of the sources of public funding of S&T activities is shown below. It can be seen that there have been steady constant price increases (current spending adjusted for inflation) in the levels of exchequer-sourced funding of State S&T spending over the last ten years. These exchequer-sourced increases have been the main drivers of the overall increase in State S&T spending in that period. In contrast, constant price spending sourced from the net income receipts of S&T activities has remained largely unchanged in the last ten years. A marked drop in real EU-sourced funding of State S&T projects has continued, with EU receipts in 2005 around 17% of their peak total in 1998.

Figure 2: Sources of funding for S&T in the State sector in constant prices, €m.

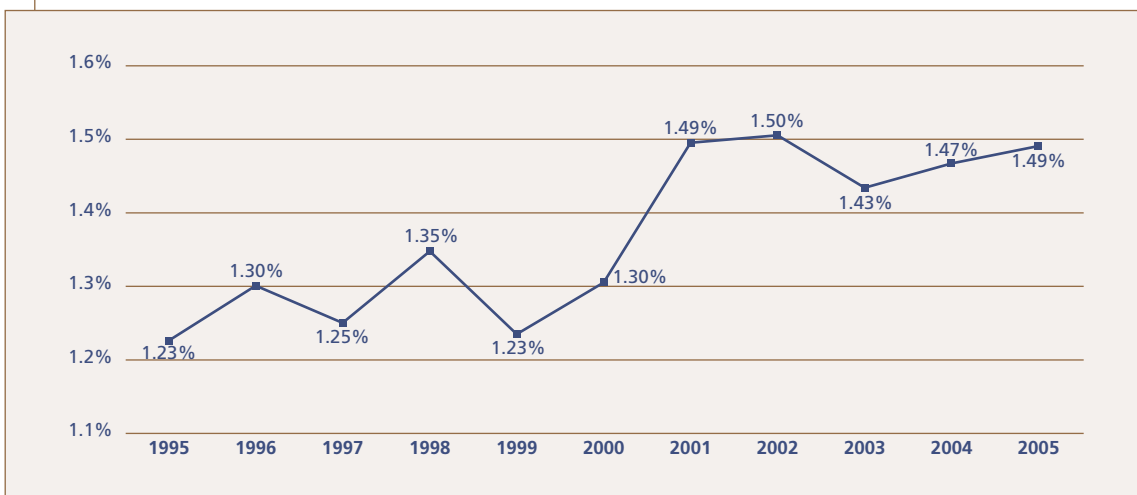


As discussed previously, exchequer sourced funding for S&T spending increased by 5.6% in real terms in 2004 compared to the previous year. The allocated funding for 2005 shows a 5.4% increase over the 2004 figure. By contrast the anticipated contribution by the EU and through earned income both show a decline for 2005 of 15% and 4% respectively over the corresponding 2004 outturn figures.

1.4 Public Funding of science and technology as a % of GNP 1995-2005

Public funding of science and technology consists of funding directly from the exchequer and funding contributions from the European Union. In figure 3 public funding is shown in relative terms to the wider economy as a percentage of economic activity for the ten years from 1995 to 2005. Gross National Product (GNP) is used as a benchmark for economic activity in Ireland as the usual indicator of relative economic well-being, Gross Domestic Product (GDP) is distorted by profit repatriations from large multinational firms. The difference between GDP and GNP is now estimated to be 22% in Ireland.

Figure 3: Public funding of S&T as a percentage of GNP (current prices)



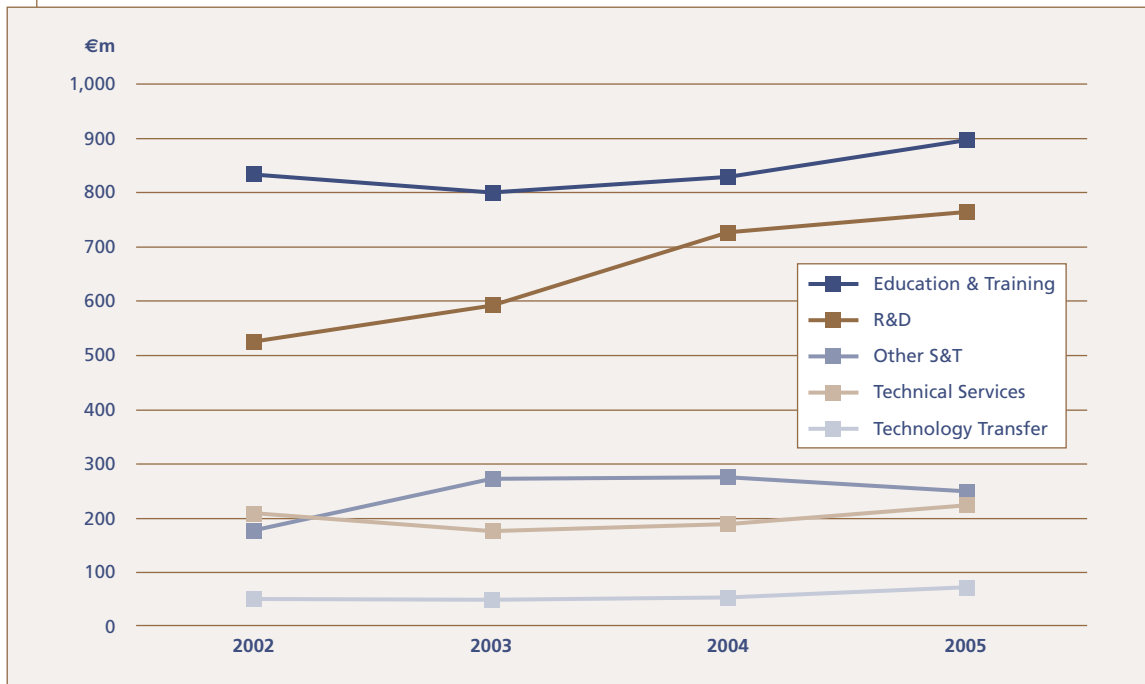
As figure 3 demonstrates, the relative intensity of science and technology spending from public sources to economic activity has fluctuated over the last ten years. The spending intensity moved from 1.23% to 1.30% of GNP between 1995 and 2000, before rising sharply between 2000 and 2002 to 1.50% of GNP.

Following a fall in the ratio of public funding of S&T spending to GNP in 2003, the intensity of spending has climbed once more to reach an estimated 1.49% of GNP in 2005. This increasing intensity has occurred in a period of high economic growth, where increases in public funding in the science budget of between 7% and 9% have outweighed the rate of expansion of the overall economy. In nominal terms, public funding of S&T activities rose by 7.7% from 2004 to reach €1.96 billion in 2005.

1.5 Trends in S&T spending by activity, 2002 - 2005

Between 2002 and 2005, spending on S&T by the State, in the activities of education and training, has continued to be the largest area of investment. That said, the significant increases in the area of research and development, by the State, has allowed a narrowing of the spending gap between this key area and the top investment area. There have been less noticeable spending increases in the areas of technical services and technology transfer. Figure 4 below outlines nominal spending on S&T by activity from 2002 to 2005.

Figure 4: State S&T spending by activity 2002-2005 €m (current prices)



In 2004, S&T spending by the State in the area of education and training rose by 3.6 % in nominal terms in comparison to 2003. In contrast, spending on research and development activities funded by the State rose by 22.8% in the same period, mostly as a result of significant increases in R&D funding from Science Foundation Ireland. Other areas of S&T spending also enjoyed strong increases from 2003 to 2004, with spending in the area of S&T technology transfers rising by 10.1% and expenditure on technical services increasing by 7.8%.

More recent data for 2005 shows that State spending growth allocated to education and training and R&D activities is expected to come in at around 8.3% and 5.3% respectively. State spending on technical services is expected to climb by 18.5% in 2005, while an even bigger increase of 35.8% is expected in the area of S&T technology transfer.

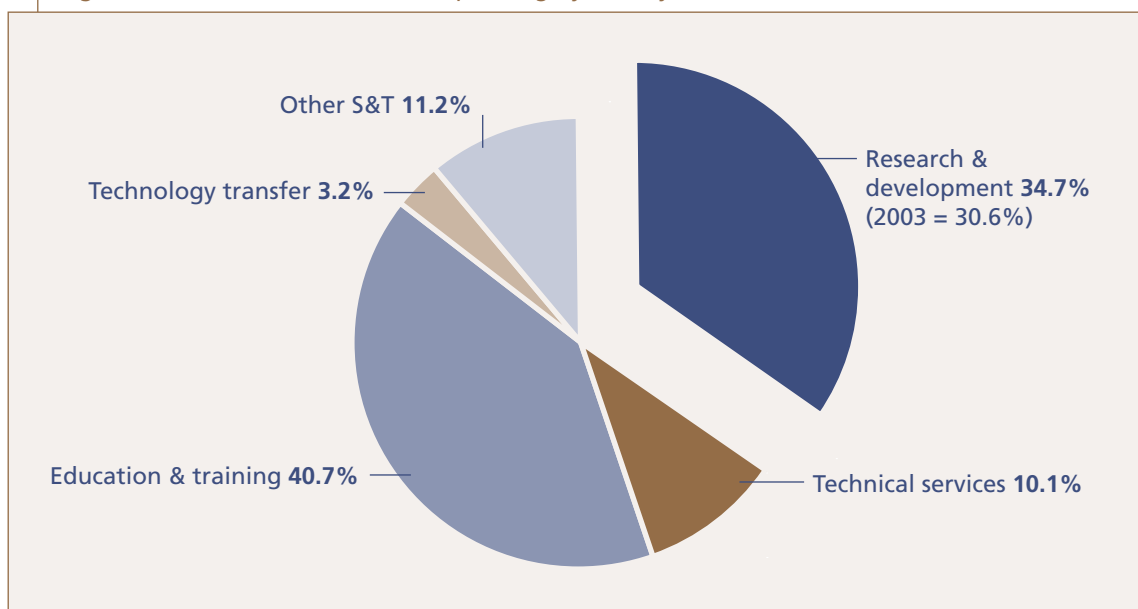
1.6 Science and technology funding by activity, 2005

Total State spending on science and technology activities in 2005 can be further broken down and classified into the following areas (details on how programmes are allocated to various areas are listed in the introduction to this report):

- ▶ *Research and development*
- ▶ *Technical services*
- ▶ *Training, education and information*
- ▶ *Technology transfer, and*
- ▶ *Other S&T activities.*

Figure 5 below shows the distribution and share of total State allocated funds in the area of science and technology between the various activities for 2005.

Figure 5: 2005 Distribution of S&T spending by activity



The bulk of the funds have been allocated to education and training and research and development, which between them account for 75.4% of the total or €1,656,360. The share of State spending on research and development has risen from a share of 31% of the total S&T spend in 2003, to a share of 34.7% in 2005. Additional and targeted R&D funding in the science budget from Science Foundation Ireland and PRTL I programs has contributed to this increased share.

Of the remaining 25%, technical services account for 10.1% of the total S&T budget in 2005 (€221,344), other science and technology activities 11.2% (€246,730) and the remaining 3.2% will fund technology transfer activities.

In 1996 the percentage of S&T spending dedicated to R&D activities was 18% (30.6% in 2005), with education and training accounting for 33% of State spending. In that same year technical services made up 28% of the total S&T budget, well above the 10.1% share recorded in 2005.

1.7 Indicative distribution of government funds for science and technology, 2005

As well as analysing the levels of funding of the five types of activity in the overall science budget it is possible to examine where each of the scientific areas was able to source its funding from i.e. from exchequer, EU or other sources (which includes businesses and other contributions).

Table 3 shows this information for State S&T spending in 2005.

Table 3: Indicative distribution of government funds for S&T, 2005

Sources of funds	R&D €m	Technical services €m	Training & education €m	Technology transfer €m	Other S&T €m	TOTAL €m
Exchequer	616.7	220.9	798.6	67.8	216.0	1,919.9
EU	21.7	0.4	0.5	2.6	21.0	46.2
Other sources	123.6	0.1	95.2	0.0	9.7	228.6
Total	762.0	221.4	894.3	70.4	246.7	2,194.7

Spending on R&D activities within the State S&T budget is mainly sourced, like all other activities, from the exchequer. Nearly 81% of all State R&D spending is financed in this way. Almost 16.2% of spending on R&D is sourced from "other sources" (including Irish industry) and from receipts from net incomes. Finally, 2.8% of State spending on R&D was financed from EU programmes.

Almost 90% of spending on the largest S&T activity "training and education", comes from the exchequer with around 11% from other sources. Little spending, in this area, is sourced from the EU.

In the area of "technical services" funds are sourced directly from the exchequer. Of the €221.4 million spent by the State in this S&T area in 2005, only €0.5 million was sourced from outside the exchequer.

Finally, spending in the S&T area of "technology transfer" which enjoyed a 35.8% nominal rise between 2004 and 2005, is funded mostly from the exchequer. In 2005, €67.8 million of exchequer funding was devoted to technology transfer areas across the Science Budget, amounting to 96.3% of the total spend in this area.

2 Research and Development

2.1 Total State funding of scientific R&D

One of the most important areas of focus in the overall science budget is spending dedicated to the area of research and development. Investment in R&D by the State will help drive the Irish economy in its transition to become a more knowledge-driven economy with high value-added activities.

The OECD definition of R&D is:

“Research and experimental development (R&D) comprises 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.” (Frascati Manual, OECD, 2002).

The State currently invests in a wide range of R&D based programmes including:

- ▶ *Programmes to support research and development performed in the higher education sector e.g. funding given via Science Foundation Ireland, the Higher Education Authority PRTLII, IRCSET and IRCHSS*
- ▶ *R&D programmes performed in the government sector by government departments and agencies e.g. Teagasc and the Health Research Board*
- ▶ *Projects to assist businesses develop and increase R&D capabilities e.g. via programmes operated by IDA Ireland and Enterprise Ireland*
- ▶ *Supporting R&D infrastructure across all sectors of performance.*

As discussed in the previous chapter the share of total State spending dedicated to the key area of R&D has been increasing in recent years.

Figure 6: Funding of S&T activities (incl. earned income), 2003, €m

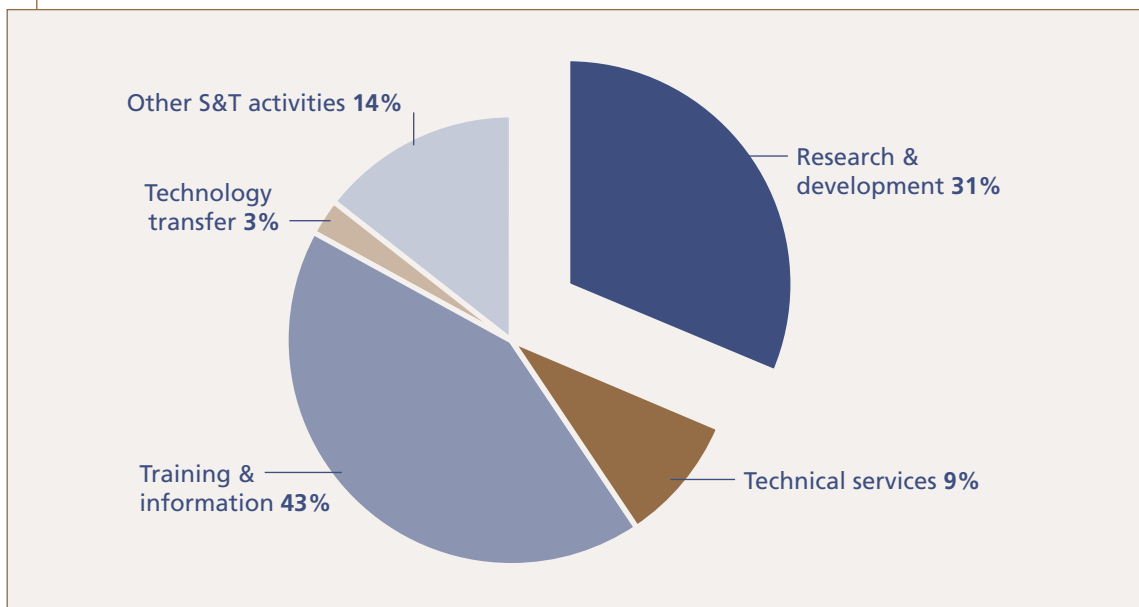
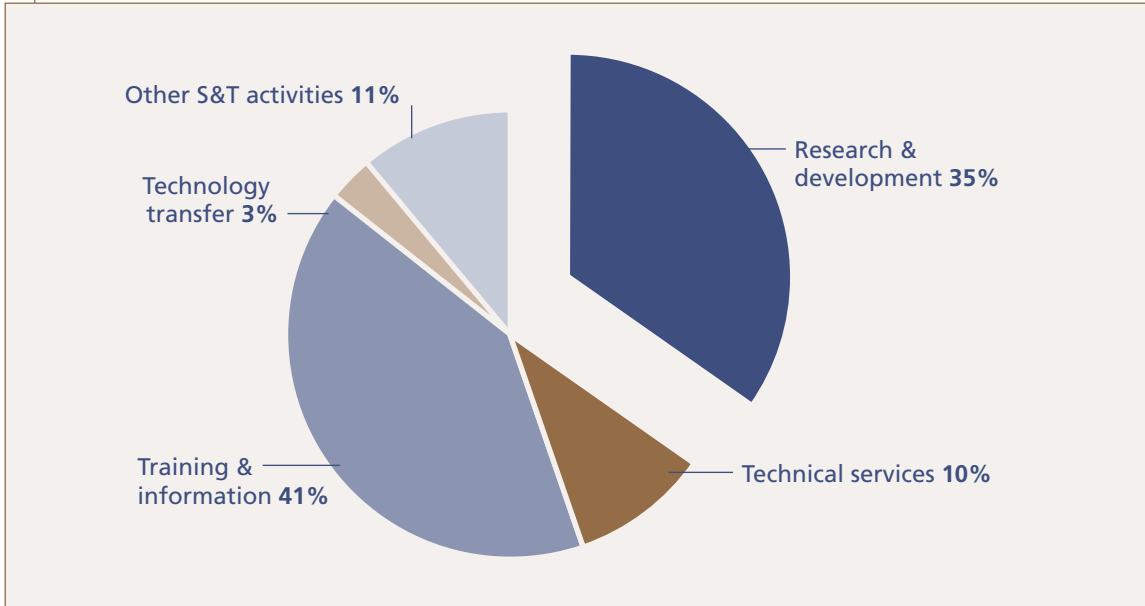


Figure 7: Funding of S&T activities (incl. earned income), 2005, €m

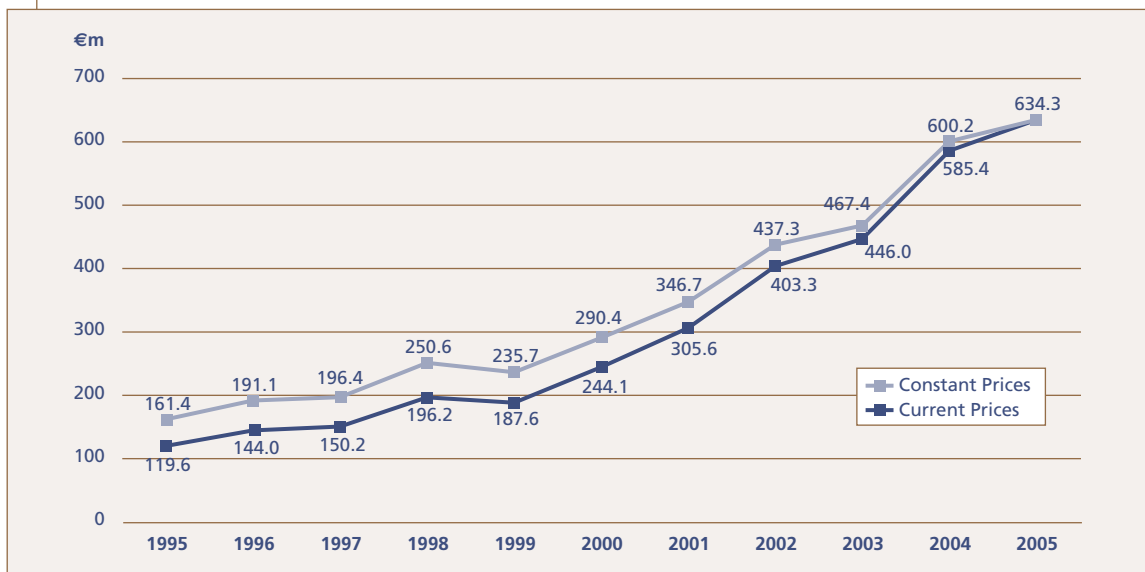


In 2005 the total State budget dedicated to R&D activities totalled €762 million (including receipts from net incomes). This amounted to a rising 35% share of the anticipated total science budget spend.

2.2 Total public funding of scientific research and development

The total public funding by government and the EU, from 1995 to 2005, for scientific research and development is shown in Fig. 8. The series is shown in current and constant prices (stripping out inflationary effects). Net income receipts or funding from non government areas toward R&D activities are not included in this series. It can be seen that there have been strong increases in the last six years in public R&D spending. Since 2003 funding has increased sharply from €446m to €634.3m in 2005, an increase of 42% in nominal terms and 36% in real terms. That said, there has been a slow down in the strong rate of expansion in public R&D spending which reached 31.1% in 2003-2004, but which eased to 8.4% between 2004 to 2005.

Figure 8: Public funding of R&D (excluding earned income), current and constant prices 1995-2005



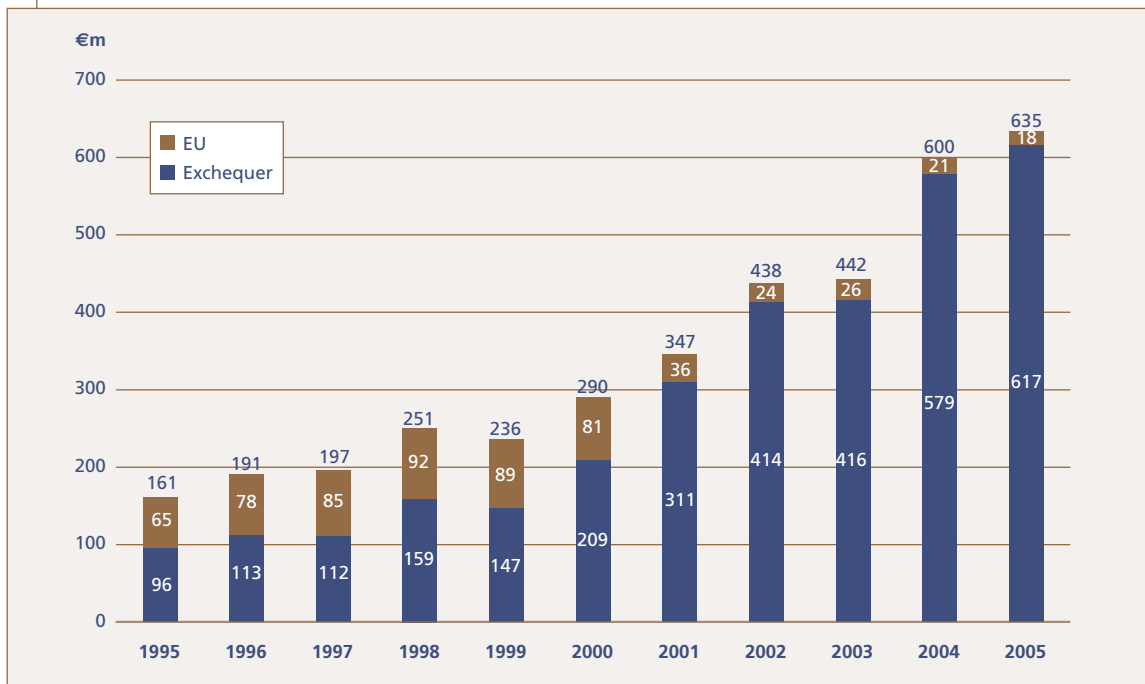
In general since 1995 public funding of research and development activities has continued to rise, with the exception of 1999, which showed a slight drop of -4.4% in nominal and -6% in real terms over the previous year. This increase in funding is due mainly to increased spending by government, as the EU contribution as a percentage of total public spending, has declined considerably since 1995. In the last ten years spending on R&D activities has almost quadrupled in real terms.

2.3 Sources of public funding for scientific research and development

The main sources for public research and development funding over the past 10 years have been via the exchequer and the EU. Total funding has risen in real terms from €161m. in 1995 to €635m. in 2005. This includes funding for R&D performed in all areas of the economy, including the higher education and State sectors, alongside public money invested in R&D activities, performed in the business sector.

The exchequer's percentage share of total public funding has risen from 60% in 1995 to 97% in 2005. By contrast the EU contribution has dwindled from 40% in 1995 to just 3% in 2005. This corresponds with the trends in the sources of funding for other science and technology activities generally, and is also in line with fall-offs in other EU sourced overall funding since 2000.

Figure 9: Sources of public R&D funding, 1995-2005 (excluding earned income) – 2005 prices €m



Between 2003 and 2004, exchequer sourced funding of R&D activities rose from €416 million in nominal terms to €579 million (an increase in exchequer sourced funding of 39.2%). Exchequer sourced funding of public R&D is expected to grow by a more modest 6.6% between 2004 and 2005, to total €617 million. Details of individual departmental spending on R&D activities in 2004 and 2005 is shown in the following table.

2.4

Public funding of research and development by departments and offices

Table 4: Public funding of research & development

Funding department or office	Allocating organisation	2004			2005		
		Exch €'000	CSF €'000	Total public funding €'000	Exch €'000	CSF €'000	Total public funding €'000
Enterprise, Trade & Employment	Enterprise, Trade & Employment	11,410	0	11,410	12,279	0	12,279
	Enterprise Ireland	47,380	14,308	61,688	58,197	10,940	69,137
	HEA	6,747	0	6,747	3,075	0	3,075
	IDA Ireland	11,827	2,966	14,793	16,500	3,500	20,000
	Shannon Development	1,631	1,854	3,485	1,897	2,000	3,897
	NSAI				0	0	0
	FÁS	2,996	172	3,168	2,994	0	2,994
	Dublin Ins. for Advanced Studies	65	0	65	78	0	78
	Economic and Social Research Institute	372		372	358	0	358
	Science Foundation Ireland	107,289		107,289	120,550	0	120,550
	Forfás	500	0	500	545	0	545
	Teagasc	275	0	275	0	0	0
	Údarás na Gaeltachta	819	0	819	0	0	0
	Nat. Microelectronics Application Centre	101	0	101	145	0	145
Sub-total		191,412	19,300	210,712	216,621	16,440	233,061
Education and Science	Dept. of Education and Science	57,053	0	57,053	72,689	0	72,689
	Higher Education Authority	139,052		139,052	128,882	0	128,882
	Dublin Institute For Advanced Studies	2,002	211	2,213	2,200	311	2,511
	IRCHSS	7,418	0	7,418	7,400	0	7,400
	Economic and Social Research Institute	341	0	341	152	0	152
	IRCSET	13,400	0	13,400	16,350	0	16,350
Sub-total		219,266	211	219,477	227,673	311	227,984
Agriculture and Food	Dept. of Agriculture & Food	7,510	0	7,510	8,029	0	8,029
	HEA	7,570	0	7,570	12,570	0	12,570
	Teagasc	49,487	0	49,487	48,407	0	48,407
Sub-total		64,567	0	64,567	69,006	0	69,006
Health and Children	Dept. of Health & Children	3,312	0	3,312	3,831	0	3,831
	Health Research Board	26,036	0	26,036	35,055	0	35,055
	ESRI	2,185	0	2,185	2,438	0	2,438
	Food Safety Authority	318	0	318	490	0	490
Sub-total		31,851	0	31,851	41,814	0	41,814

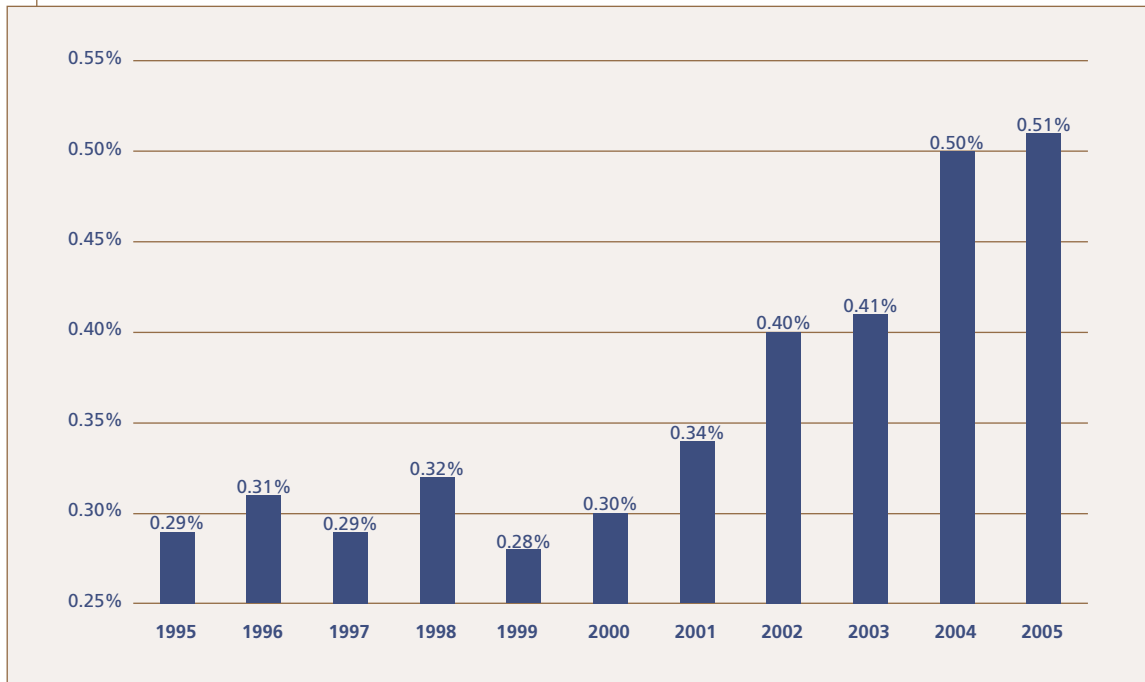
Funding department or office	Allocating organisation	2004			2005		
		Exch €'000	CSF €'000	Total public funding €'000	Exch €'000	CSF €'000	Total public funding €'000
Communications, Marine & Natural Resources	Dept. of CM&NR	57	0	57	167	0	167
	Marine Institute	15,936	0	15,936	17,221	0	17,221
	BIM	902	134	1,036	1,851	194	2,045
	COFORD	1,395	0	1,395	1,522	0	1,522
	HEA	2,090	0	2,090	4,000	0	4,000
	Media Lab. Europe	7,856	0	7,856	0	0	0
	Central & Regional Fisheries Board	972	28	1,000	978	22	1,000
	Sustainable Energy Ireland	3,850	677	4,527	4,964	636	5,600
	ESRI	42	0	42	0	0	0
Sub-total		33,100	839	33,939	30,703	852	31,555
Environment, Heritage and Local Government	Met Éireann	1,999	0	1,999	2,284	0	2,284
	HEA	7,317	0	7,317	7,000	0	7,000
	RPII	437	0	437	441	0	441
	ESRI	31	0	31	17	0	17
	Central & Regional Fisheries Board	60	0	60	18	0	18
	Teagasc	705	0	705	0	0	0
Sub-total		10,549	0	10,549	9,760	0	9,760
Social & Family Affairs	Dept. of Social & Family Affairs	4,691	0	4,691	6,139	0	6,139
	ESRI	270	0	270	63	0	63
Sub-total		4,961	0	4,961	6,202	0	6,202
Community, Rural & Gaeltacht Affairs	Dept. of CR&GA	0	0	0	0	0	0
	Údarás na Gaeltachta	1,734	0	1,734	2,600	0	2,600
	Health Research Board	277	0	277	0	0	0
Sub-total		2,011	0	2,011	2,600	0	2,600
Finance	ESRI	6,558	0	6,558	5,447	0	5,447
Sub-total		6,558	0	6,558	5,447	0	5,447
Taoiseach	NESC	749	0	749	788	0	788
	ESRI	0	0	0	0	0	0
Sub-total		749	0	749	788	0	788
Transport	NRA	278	0	278	246	0	246
	Met Éireann	194	0	194	0	0	0
Sub-total		472	0	472	246	0	246
Central Bank	Central Bank	549	0	549	519	0	519
Sub-total		549	0	549	519	0	519
Arts, Sport & Tourism	Arts, Sport and Tourism	226	0	226	222	0	222
Sub-total		226	0	226	222	0	222
Office of Public Works	Office of Public Works	8,299	0	8,299	5,117	0	5,117
Sub-Total		8,299	0	8,299	5,117	0	5,117
Total		574,570	20,350	594,920	616,718	17,603	634,321
% Total		97%	3%	100%	97%	3%	100%

2.5 Government budget allocations as a percentage of GNP

The GBAORD indicator is the international metric used to measure and compare public funding of research and development. The GBAORD indicator includes all publicly funded R&D spending from the exchequer and from the EU, contained in the Science Budget. In addition, spending on public R&D in the arts and humanities areas is also included.

Between 2004 and 2005, GBAORD in Ireland rose from €625 million to €676 million, representing an 8.2% nominal increase. Figure 10 below displays GBAORD as a percentage of GNP since 1995.

Figure 10: GBAORD as % of GNP, 1995-2005



Although the relative intensity of GBAORD to GNP fell between 1995 and 1999, this was not as a result of falling spending on public R&D activities. It was caused by the increase in nominal R&D spending being outweighed by the growth of GNP in the same period. During this strong period of economic growth, the GBAORD intensity ratio fell from 0.29% of GNP to 0.28% of GNP.

In more recent years, increased funding growth of GBAORD, alongside a slowing rate of economic expansion has allowed the GBAORD/GNP ratio to rise once more. The 2004 and 2005 figures show considerable increases over the previous two years. In relative terms GBAORD as a percentage of economic activity has increased from 0.41% of GNP in 2003 to 0.51% of GNP in 2005. Chapter 5 of this publication provides additional detail on GBAORD and also shows international benchmarking of GBAORD and also data on GBAORD spending on civil R&D (which excludes R&D spending on defence and weapons).

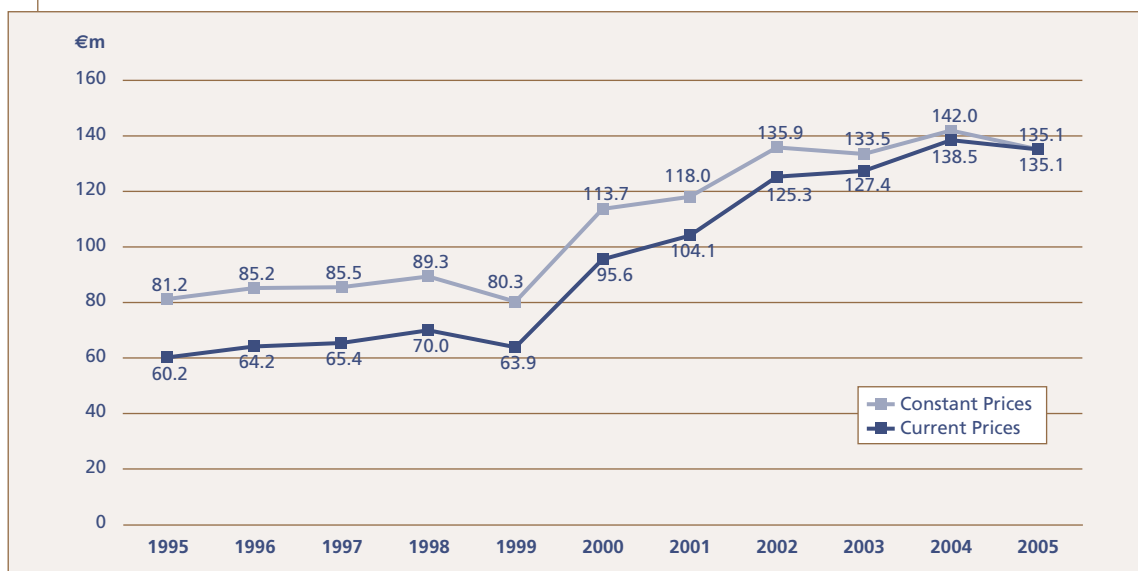
3 Performance of Research and Development in the Public Sector

3.1 Expenditure on research and development performed in the public sector 1995-2005

This chapter moves on from the previous chapters which focussed on expenditure on science and technology and research and development, to examine the performance of R&D in the public sector. This includes R&D carried out by State bodies such as Teagasc and the Marine Institute among others, but excludes R&D performed in the higher education sector (this R&D performance is capture in the higher education R&D survey which is also carried out by Forfás).

Figure 11 below charts the amount spent on research and development which was performed in the public sector from 1995 to 2005 (GOVERD).

Figure 11: Expenditure on R&D performed in the public sector (current and constant prices) 1995-2005



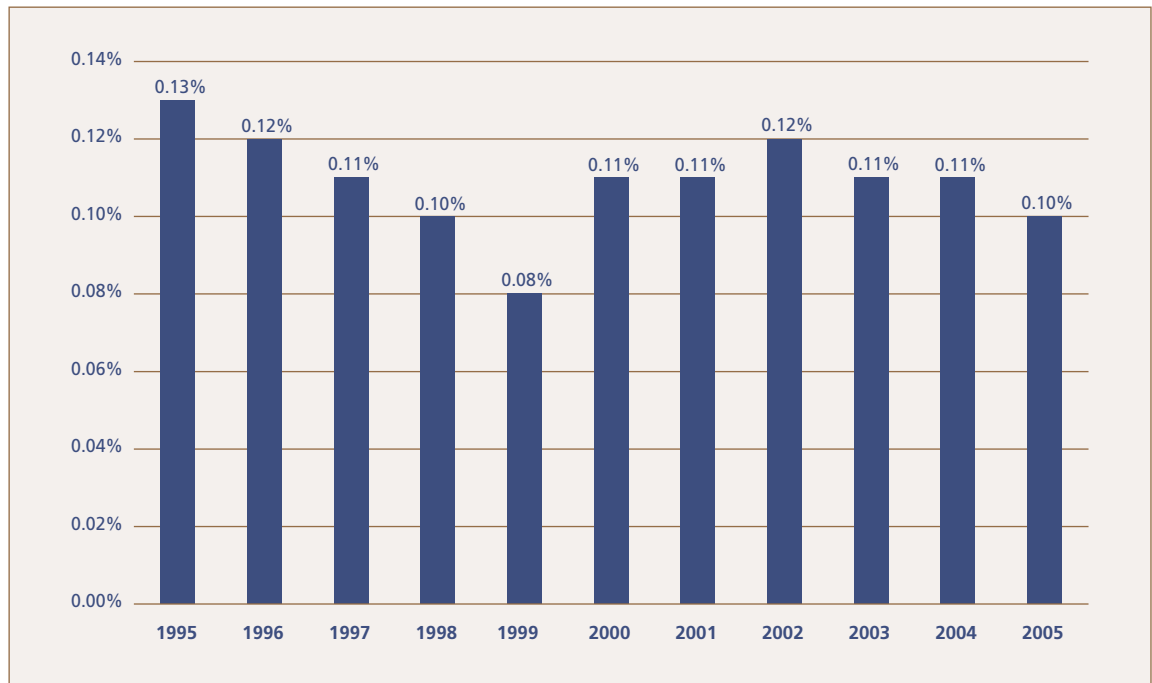
Research and development, performed by the public sector rose to €138.5 million in 2004, an increase of 8.7% compared to the previous year in nominal terms, and a rise of 6.4% in real terms.

GOVERD however, is expected to drop slightly for 2005 to €135.1m. an annual fall of 2.5% in nominal terms and 4.9% in real terms (using 2005 constant prices).

3.2 Performance of R&D in the public sector as a % of GNP

Figure 12 shows performance of research and development in the public sector (GOVERD) as a percentage of Gross National Product since 1995. Again the GNP figure, which excludes net income flows for economic activity, is used to benchmark Irish performance.

Figure 12: GOVERD as a percentage of GNP, 1995-2005



Performance as a percentage of GNP decreased from 0.11% in 2004 to 0.10% in 2005. In the past 5 years the performance level as a percentage of GNP has fluctuated between 0.12% and 0.10%. The next section features a table listing the 2005 breakdown of GOVERD by major government departments and agencies.

3.3 Major performers of research and development in the public sector

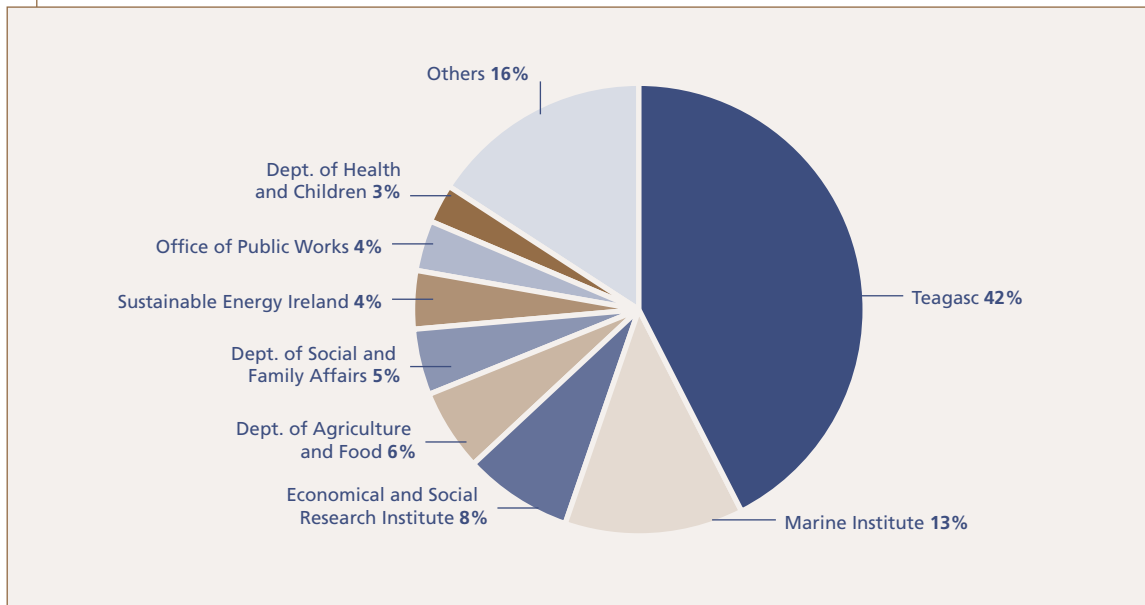
Total expenditure on research and development in the public sector is estimated to amount to €135.1m. in 2005 as compared with €127.4m. in 2003 (current prices). Table 5 below shows the share of total GOVERD expenditure per department or agency. As can be seen Teagasc continue to be the largest performer of R&D in the State sector, accounting for 42.4% of the total R&D performance in the sector.

Table 5: GOVERD expenditure per department/agency

Dept./Agency Name	R&D Total Allocation €'000 2005
Teagasc	57,309
Marine Institute	17,221
Economic & Social Research Institute	10,666
Dept. of Agriculture & Food	8,029
Dept. of Social and Family Affairs	6,139
Sustainable Energy Ireland	5,600
Office of Public Works	5,117
Dept. of Health and Children	3,831
Others	21,216
Total GOVERD	135,128

The major public sector performers of research and development in 2005 in the State are shown in Figure 13.

Figure 13: Major public sector performers, 2005 (total = 135m)



4 Personnel Engaged in Research and Development

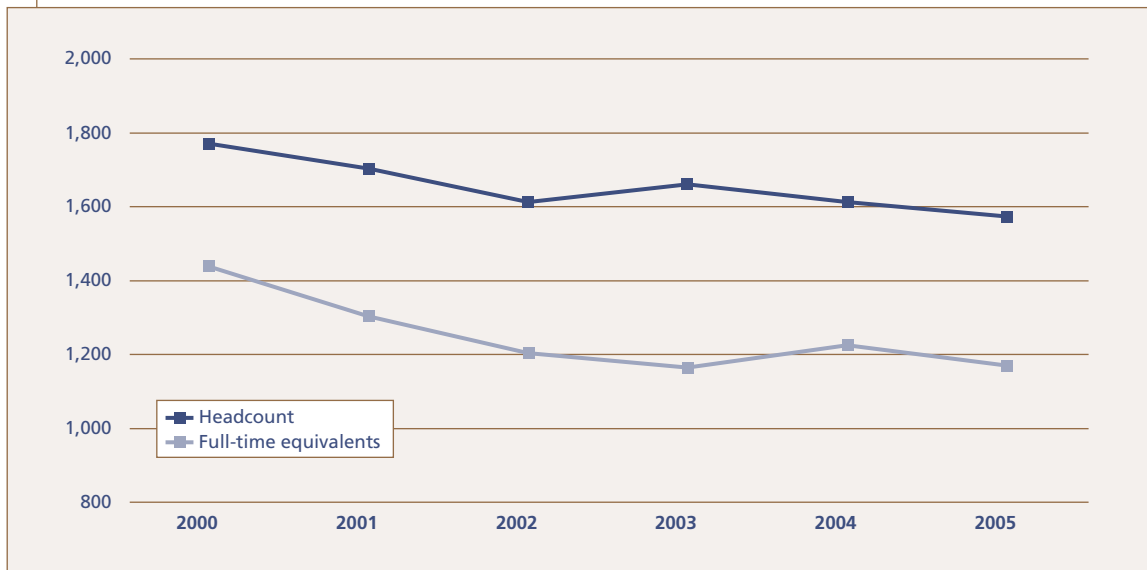
This chapter focuses on personnel involved in R&D activities performed in the State sector (excluding higher education). For the science and technology budget, questionnaires were sent to State institutions asking them to detail the number and gender of researchers and support staff involved in R&D activities performed within the State sector.

In addition to collecting data on a headcount basis, the survey also asked for information on the percentage of time spent on research by these personnel. This data was used to convert the headcount data into "full-time equivalence". Information on the numbers of staff with PhD qualifications was also sought.

4.1 Researchers and research personnel in the State sector

Figure 14 below shows a five year trend of personnel employed in R&D activities performed in the State sector (2000-2005). It shows personnel numbers (which includes researchers and support staff) in terms of headcount (HC) and full-time equivalents (FTE). To convert the data to FTE from HC, a time use co-efficient is applied (e.g. if a person spends half their time on R&D activities and half of their time on other non-R&D activities, then they are counted as 0.5 FTE for R&D personnel).

Figure 14: Total R&D personnel in the State sector (2000-2005)

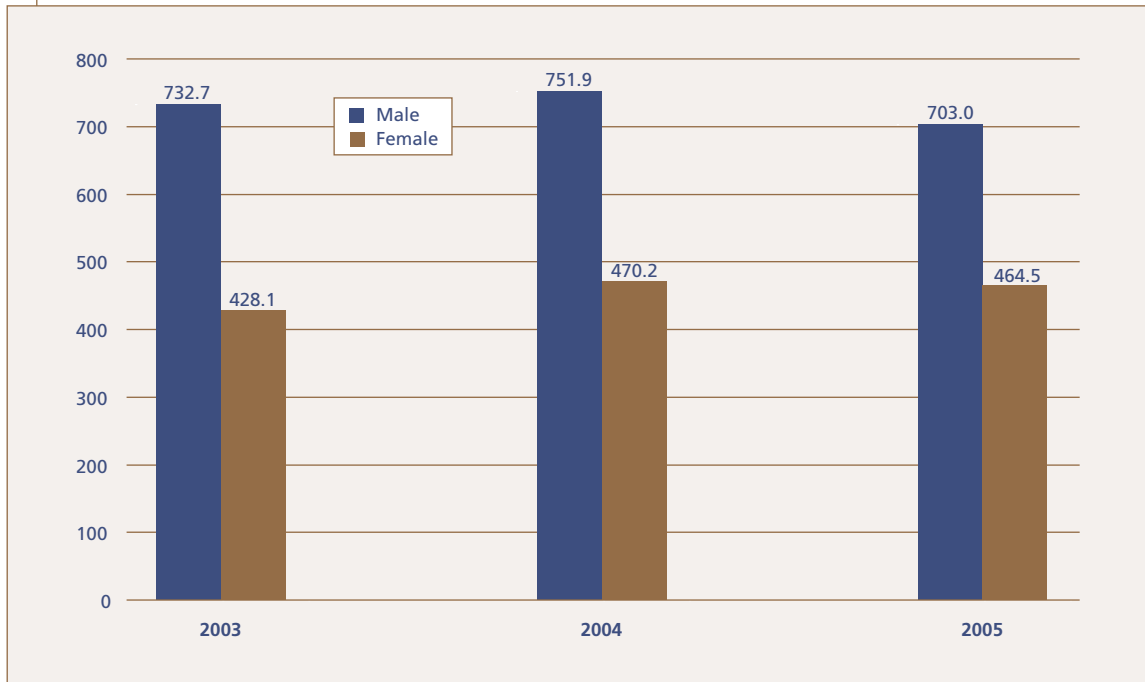


The number of personnel involved in performing R&D in the State sector fell to an estimated 1,569 in 2005 in headcount terms, a fall of 2.5% from the previous year. In terms of FTE there was a fall of 4.5% in numbers of research personnel in the State sector between 2004 and 2005.

4.2 Full-time equivalents devoted to research and development by gender

“Full-time equivalence” attempts to measure the amount of time actually spent on research and development by any one individual, as opposed to time spent on other non-R&D related work. It is the metric used to compare performance with other countries on a like-for-like basis. Figure 15 below shows total research personnel employed in the State sector in Ireland from 2003-2005, broken down by gender.

Figure 15: Full-time equivalent R&D personnel by gender (2003-2005)



As discussed previously the number of FTE research personnel carrying out activities in the government sector fell by 4.5% between 2004 and 2005 to stand at 1,167 personnel. The number of male FTE research personnel fell by 6.5% to stand at 703 in 2005, which is ahead of the 1.2% fall in female research personnel in the same period.

Figure 16: Total personnel engaged in R&D by gender 2003

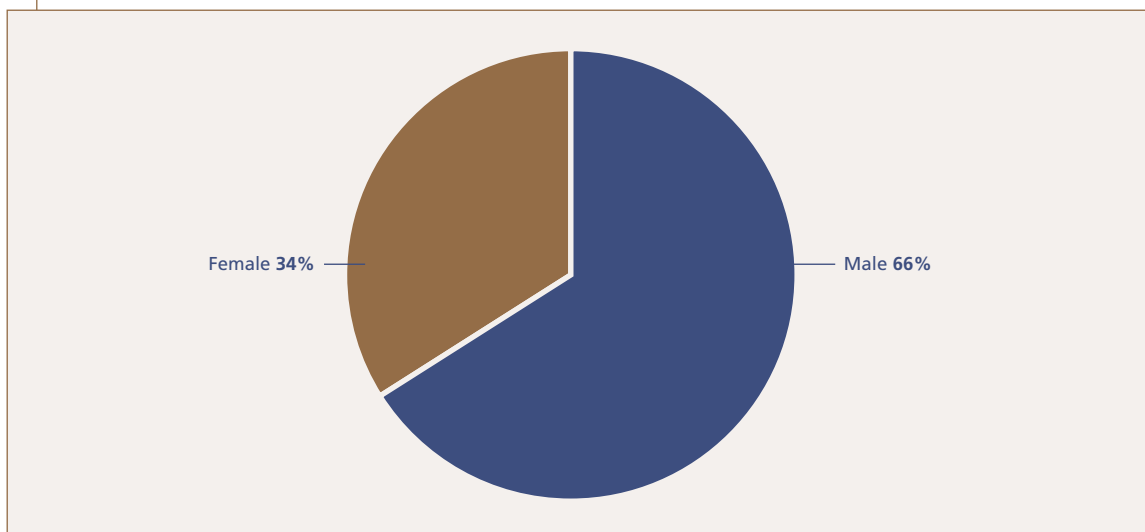
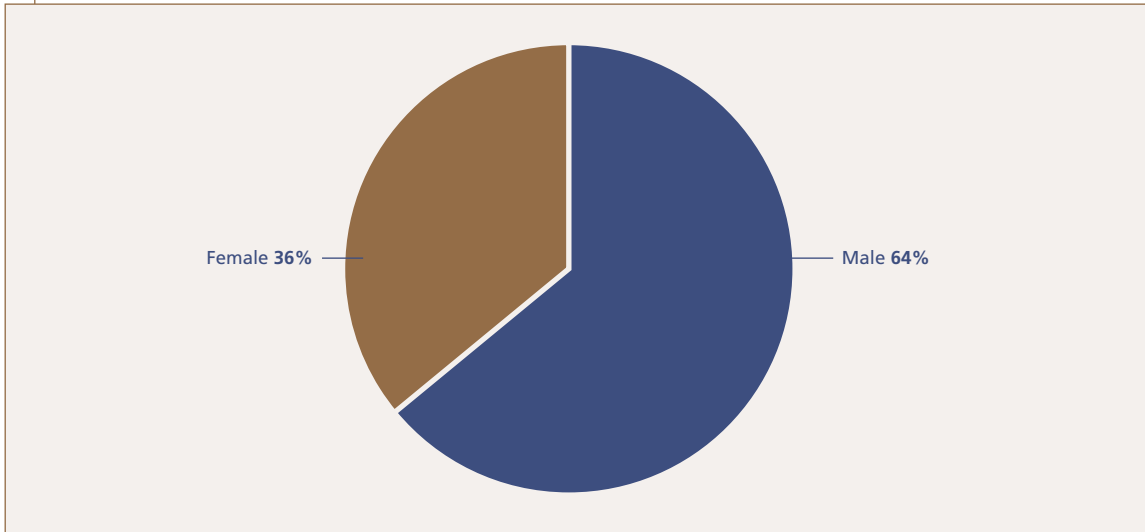


Figure 17: Total personnel engaged in R&D by gender 2005

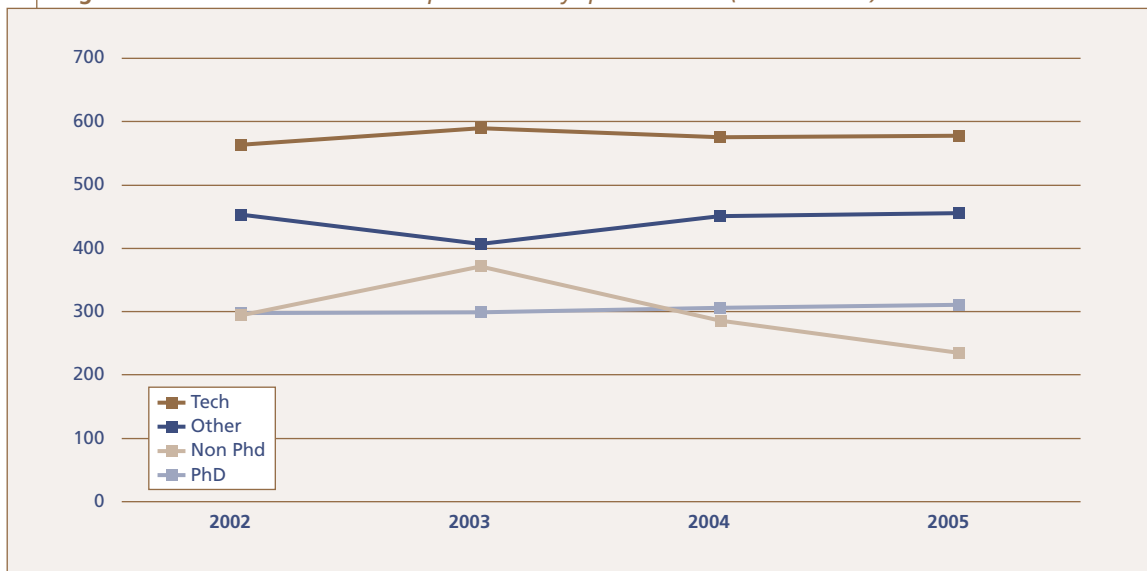


In 2003 female research personnel made up 37% of the total FTE personnel number, and 34% of the headcount number. This ratio increased to 40% in 2005 and 36% of headcount.

4.3 Research and development personnel by qualification

The personnel questions within the 2004/2005 science budget also asked R&D performing units within the Government sector to identify and detail those researchers who had PhD qualifications. In 2005 the number of PhD qualified research scientists and engineers rose to 309 from 304 in headcount terms. Numbers of non-PhD research scientists and engineers fell for the second successive year, falling to 233 well below the 369 counted in 2003. Numbers of technicians and support staff remained virtually unchanged at 575 and 453 respectively in 2005.

Figure 18: Government research personnel by qualification (2002 – 2005)



Figures 19 and 20 compare the percentage of total researcher scientists and engineers engaged in research and development activities by qualification. Numbers of others staff and technicians are also included in the graphs.

Figure 19: Total R&D personnel by qualification 2004

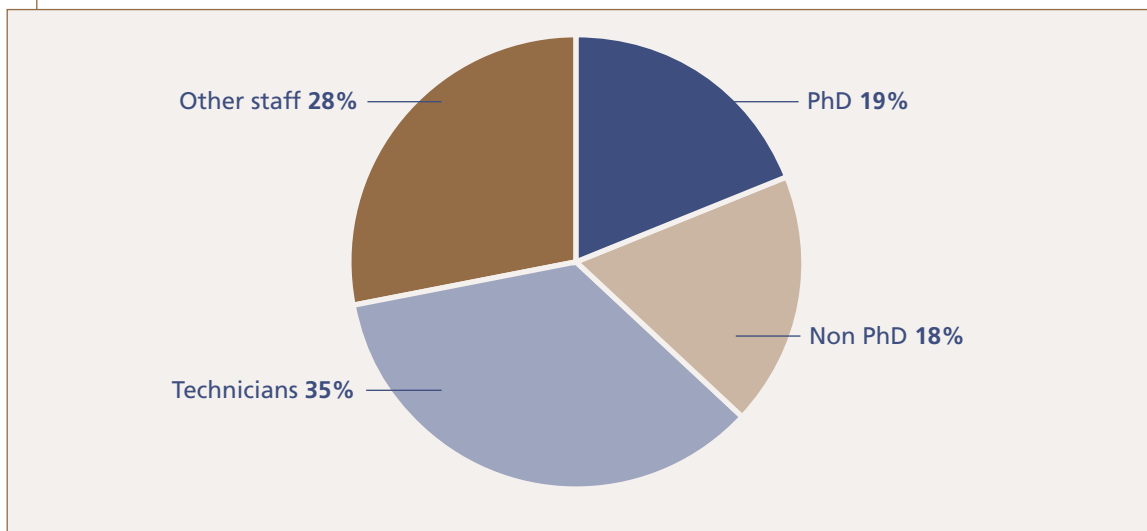
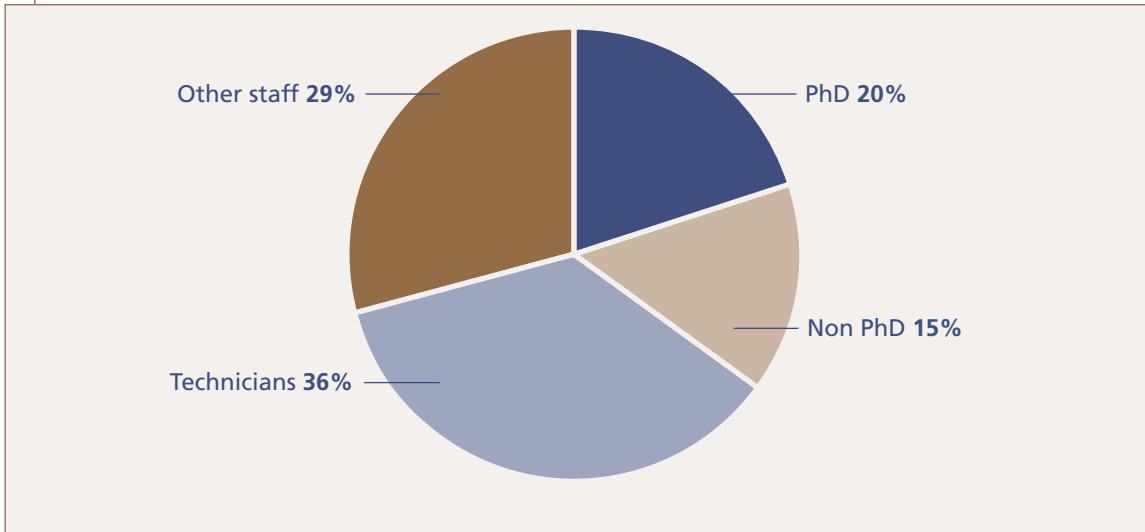


Figure 20: Total R&D personnel by qualification 2005



The main change is in the percentage of non PhD research scientists and engineers working in R&D, which has dropped from 18% in 2004 to 15% in 2005. The other three categories have increased slightly since 2004. In terms of gender 61% of male researchers are PhD qualified, compared to 49% of female researchers.

5 International Comparisons of Public Sector Research and Development

This chapter provides charts and tables which benchmark Ireland’s research and development spending and performance against that of 15 other European countries, the US and Japan. Ireland’s performance is measured as a percentage of GNP as opposed to GDP in the other countries, as it is a more accurate indicator of economic activity.

5.1 Government budget allocated to research and development as a % of GDP

Figure 21: Government budget allocated to R&D as a % of GDP (Ireland GNP), 2004 (or latest year available)

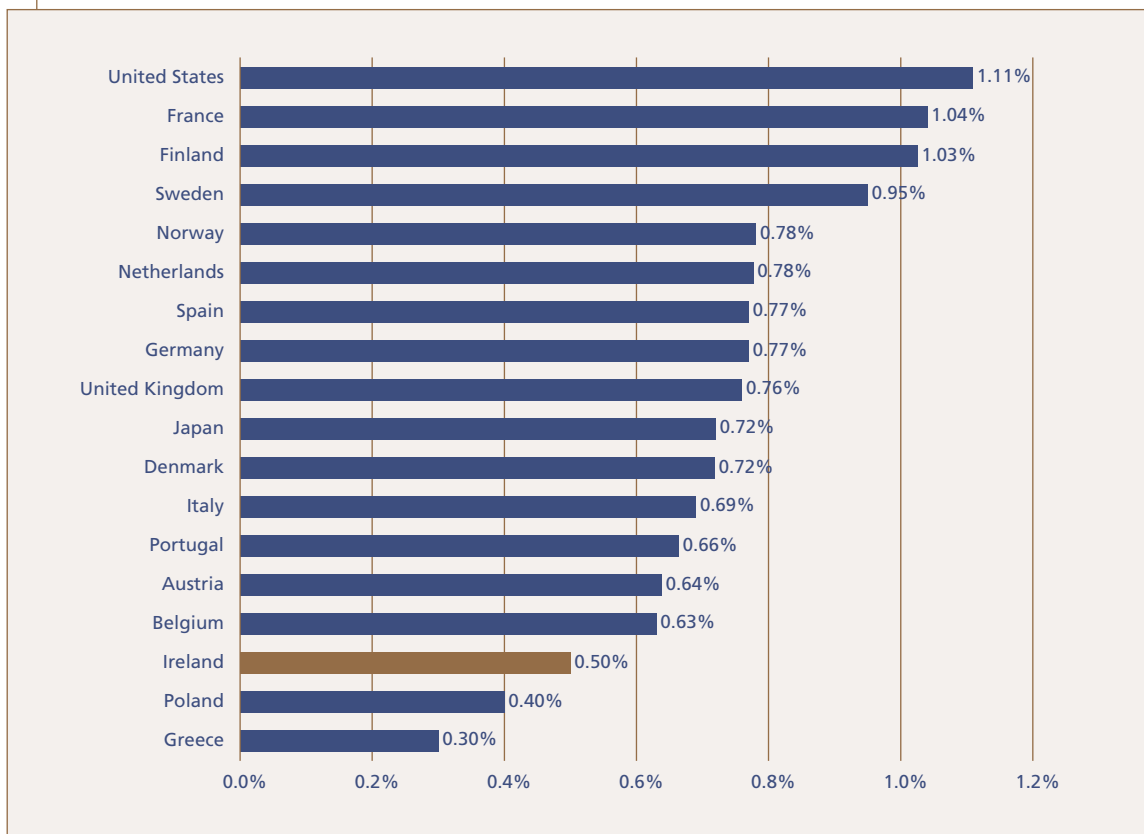


Figure 21 above charts the amount allocated to R&D in the various countries as a percentage of GDP (GNP in Ireland’s case) in 2004 or the latest year for which data is available. These figures include spending on research and development activities related to defence in the various countries. Nearly 100% of all GBAORD in Ireland is for civil purposes.

As discussed in Section 2.5, Ireland’s government budget allocation to R&D activities (GBAORD) rose to 0.5% of GNP in 2004 and 0.51% in 2005. This significant rise in spending intensity from the 0.37% ratio measured in 2002, has facilitated an improvement in Ireland’s international benchmarking position. The gap between Irish spending performance and other countries performance is exaggerated for some countries by high levels of spending on R&D for “defence” and other military purposes. 100% of Ireland’s research and development expenditure is spent on civil R&D, while over 50% of spending in the United States goes towards defence R&D.

5.2

Civil research and development funding by the government sector for selected countries, 1995 and 2004

Ireland's spending on civil research and development as a percentage of Gross National Product rose to 0.50% in 2004 from 0.37% in 1995. This allowed for a small rise in Ireland's international ranking to take place, although the country still continues to lag behind the relative spending performance of major competitors on the international stage.

Table 6: *Government funding of civil R&D as a % of GDP (Ireland GNP) 1995 and 2004 (or latest available data)*

	1995	2004
Finland	0.96	1.00
France	0.78	0.80
Netherlands	0.83	0.76
Sweden	0.87	0.74
Norway	0.76	0.73
Germany	0.82	0.72
Denmark	0.66	0.71
Italy	0.55	0.67
Portugal	0.44	0.65
Austria	0.66	0.64
Belgium	0.52	0.63
Spain	0.44	0.59
United Kingdom	0.50	0.52
Ireland (2005) (GNP)	0.37	0.50
United States	0.43	0.49
Greece	0.28	0.30

Finland continued to top the international benchmarking tables concerning relative spending on civil GBAORD in 2004, which reached 1.0% of GDP. Civil GBAORD spending in Spain and Belgium as a percentage of GDP increased considerably since 1995. In Spain relative spending rose from 0.44% of GDP in 1995 to 0.59% of GDP for the latest year for which data were available. In Belgium, civil GBAORD rose from 0.52% of GDP to 0.63% of GDP in the same period.

Civil GBAORD allocated in Sweden, Norway, Netherlands, Germany and Austria decreased as a percentage of GDP between 1995 and 2004 (or for the latest year where international data was available).

5.3

Research and development performance within the government sector for selected countries, 1995 and 2004

Table 7 attempts to benchmark Ireland's R&D performance within the State sector (GOVERD) against that of other EU countries and the US. It excludes the performance of R&D activities which are performed within the higher education sector, which are measured by the HERD indicator.

Table 7: *R&D performed in the public sector as a % of GDP (Ireland GNP), 1995 and 2004 (or latest available data)*

	1995	2004
France	0.48	0.37
Finland	0.38	0.34
Germany	0.35	0.34
Netherlands	0.36	0.27
Norway	0.29	0.26
Belgium	0.08	0.16
Denmark	0.31	0.18
Italy	0.21	0.21
Portugal	0.15	0.19
Spain	0.15	0.17
United Kingdom	0.28	0.18
United States	0.24	0.24
Austria	0.13	0.12
Greece	0.12	0.14
Ireland (2004) (GNP)	0.13	0.11
Sweden	0.12	0.12

Research and development performed in the public sector in Ireland decreased in relative terms between 1995 and 2004. GOVERD decreased to 0.11% of GNP in 2005 from 0.13% of GNP in 1995.

Belgium, Portugal, Spain and Greece increased their percentage share slightly, while Italy, the United States and Sweden remained unchanged. All the other countries decreased their percentage share of R&D performed in the public sector between 1995 and 2004.

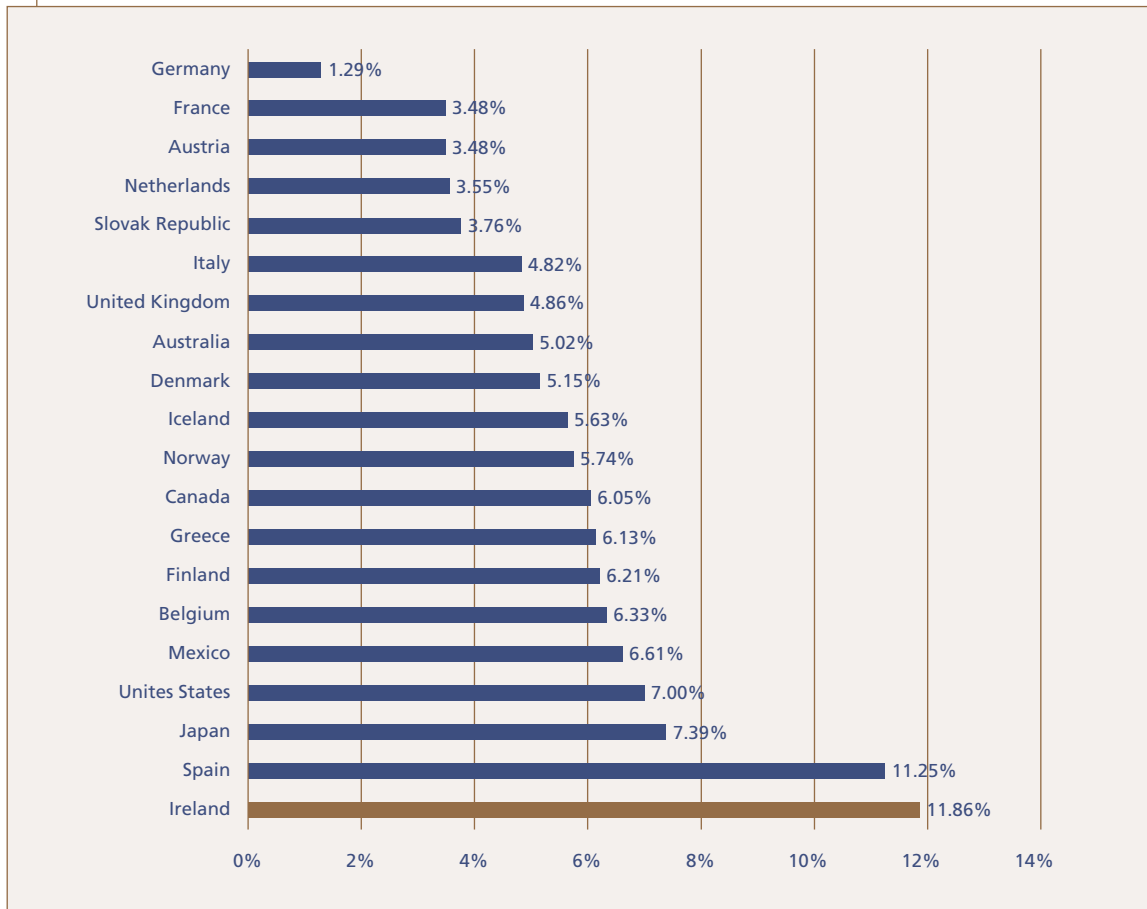
5.4

Average annual growth of government research and development budget

The following chart benchmarks Ireland’s average annual growth of the overall government budget allocation spent on R&D (GBAORD) activities between 1995 and 2004. The data is captured from the OECD Main Science and Technology Indicators database and converts the data to US\$ at Purchasing Power Parity (PPP\$) to allow for a better comparison to be made.

It can be seen that Ireland recorded the highest average annual growth in GBAORD between 1995 and 2004, with an average annual expansion of 11.86%. Irish GBAORD although growing from a low base in 1995 was able to grow strongly in line with the strong expansion in economic activity recorded during the next ten-year period. Spanish GBAORD growth was the next strongest of the countries benchmarked, with average growth of 11.25% of GBAORD posted between 1995 and 2004.

Figure 22: GBAORD average annual growth rate 1995-2004



Forfás Publications 2005

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Strategic Technology Platforms Irish Council for Science, Technology and Innovation	March 2005
Towards the Seventh EU Framework Programme for Research and Technological Development Irish Council for Science, Technology and Innovation	March 2005
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An Impact Assessment of the Proposed EU Chemical Policy (REACH) on Irish Industry	April 2005
Annual Employment Survey, 2004	April 2005
Make Consumers Count: A New Direction for Irish Consumers Report of the Consumer Strategy Group	May 2005
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Functions of Forfás

Forfás is the national policy and advisory board for enterprise, trade, science, technology and innovation. It is the body in which the State's legal powers for industrial promotion and technological development have been vested. It is also the body through which powers are delegated to Enterprise Ireland for the promotion of indigenous industry and to IDA Ireland for the promotion of inward investment. Science Foundation Ireland was established as a third agency of Forfás in July 2003. The broad functions of Forfás are to:

- ▶ *advise the Minister on matters relating to the development of industry in the State*
- ▶ *advise on the development and co-ordination of policy for Enterprise Ireland, IDA Ireland, Science Foundation Ireland and such other bodies (established or under statute) as the Minister may by order designate*
- ▶ *encourage the development of industry, science and technology, innovation, marketing and human resources in the State*
- ▶ *encourage the establishment and development in the State of industrial undertakings from outside the State, and*
- ▶ *advise and co-ordinate Enterprise Ireland, IDA Ireland and Science Foundation Ireland in relation to their functions.*

Is é Forfás an bord comhairleach agus polasaí náisiúnta do fhiontar, thráchtáil, eolaíocht, theicneolaíocht agus nuálaíocht. Is é an comhlacht ina bhfuil cumhacht dlíthiúil an Stáit dílsithe i leith tionscail a chur chun cinn agus forbairt teicneolaíochta. Is é an comhlacht freisin trína thiomnaítear cumhachtaí go Enterprise Ireland chun tionscal dúchais a chur chun cinn agus do IDA Ireland chun infheistíocht isteach a chur chun cinn. Bunaíodh Science Foundation Ireland mar thríú gníomhaireacht de Forfás in Iúil 2003. Is iad na feidhmeanna leathana de Forfás ná chun:

- ▶ *comhairle a thabhairt don Aire ó thaobh cúrsaí a bhaineann le forbairt tionscail sa Stát;*
- ▶ *comhairle a thabhairt maidir leis an bhforbairt agus an gcomhordú de pholasaí do Enterprise Ireland, IDA Ireland, Science Foundation Ireland agus d'aon chomhlacht eile dá leithéid (bunaithe nó faoi reacht) mar a d'fhéadfadh an tAire a thiomnú de réir ordaithe;*
- ▶ *an fhorbairt de thionscal, theicneolaíocht, mhargaíocht agus acmhainní daonna a spreagadh sa Stát;*
- ▶ *an bunú agus an fhorbairt sa Stát de ghnóthais tionsclaíochta a spreagadh ó áiteanna lasmuigh den Stát; agus*
- ▶ *Enterprise Ireland, IDA Ireland agus Science Foundation Ireland a chomhairliú agus a chomhordú maidir lena bhfeidhmeanna.*

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Appendix 1: Methodology

The information given in this document relates to 46 institutions in receipt of monies from the exchequer for the performance or support of scientific, technological and related activities in every field and is based on the information supplied by these institutions. In general, institutions and information relating to them are listed separately. In a few cases an institution is listed with its parent department or organisation but identified separately. Where practicable the programmes of the various institutions have been separated and categorised in accordance with international practice into relevant scientific and technological activities i.e.:

- ▶ *Research and development (R&D)*
- ▶ *Technical services*
- ▶ *Training, education and information*
- ▶ *Technology transfer and*
- ▶ *Other S&T activities.*

However, in many instances, especially in institutions with few staff, institutions operate several programmes jointly, sharing resources in an administratively appropriate unit. In these circumstances the programmes, as described here, do not represent truly independent programmes. Consequently, the data should be interpreted with caution if expansions or contractions are being considered.

Expenditure data for specific programmes refer to the 2004 outturn costs of programmes and to the expected costs in 2005. The outturn costs are mainly funded by matching grant-in-aid or voted monies. Where programmes are funded in other ways these monies are noted separately. In these instances the expenditure (cost) data shown includes both exchequer and other income contributions.

Expenditures are based on unaudited figures. For convenience, general overheads, where shown, are distributed in proportion to programme expenditures. Programmes are attributed to the institution most directly involved, that is to those actually operating them, but not necessarily funding them. An example of the latter is the Department of Enterprise, Trade and Employment, which funds, but does not operate or manage many programmes. Only their own administrative costs are attributed to the funding institutions in such cases.

Numbers of staff involved in individual S&T programmes are shown only where a reasonable subdivision is possible. Where institutions are involved in funding a large number of external R&D (or similar) personnel, data on these external personnel are not given.

Apportionment problems arise in the third level sector, mainly from the monies distributed by the Higher Education Authority and the Department of Education and Science to the institutes of technology. In the case of the HEA, total funds are first apportioned between S&T faculties and non-S&T faculties in the colleges (expenditure on non-S&T faculties is not included in this document). The extent and cost of the R&D work undertaken in colleges and funded out of the HEA's general block grant, is determined indirectly from surveys of academic staff in colleges. These surveys are carried out by Forfás on a multi-annual basis and the corresponding cost data are, of necessity, based on historical estimates. The HEA funding of academic departments is isolated from administration and support services within colleges.

Appendix 2: Index of Acronyms

BIM	Bord Iascaigh Mhara - Irish Sea Fisheries Board
CRFB	Central and Regional Fisheries Boards
COFORD	National Council for Forest Research and Development
CSF	Community Support Framework
CSO	Central Statistics Office
DIAS	Dublin Institute for Advanced Studies
EPA	Environmental Protection Agency
ESRI	Economic and Social Research Institute
EU	European Union
FÁS	Foras Áiseanna Saothair – National Training and Employment Authority
Forfás	National Policy and Advisory Board for Enterprise, Trade, Science, Technology and Innovation
FSAI	Food Safety Authority of Ireland
HEA	Higher Education Authority
HRB	Health Research Board
IDA	Industrial Development Agency
IRCHSS	Irish Research Council for the Humanities and Social Sciences
IRCSET	Irish Research Council for Science, Engineering and Technology
MLE	Media Laboratory Europe
NMAC	National Microelectronics Applications Centre
NESC	National Economic and Social Council
NMRC	National Microelectronics Research Centre
NRA	National Roads Authority
NSAI	National Standards Authority of Ireland
OPW	Office of Public Works
OSI	Ordnance Survey Ireland
OST	Office of Science and Technology - Department of Enterprise, Trade and Employment
PGM&DB	Postgraduate Medical and Dental Board
RPII	Radiological Protection Institute of Ireland
SEI	Sustainable Energy Ireland
SFI	Science Foundation Ireland

Appendix 3: Transfer Payments Between Departments and Agencies

The science and technology infrastructure is very complex with a range of agencies/departments donating and receiving funds from each other to fund various S&T activities. Table 8 outlines the planned flow of funds for 2005.

Table 8: *Planned transfer payments between S&T organisation for S&T activities, 2005, €'000*

From:	Office Public Works	Dept of Environment, Heritage & Local Government	Environmental Protection Agency	Dept. of Education & Science	Higher Education Authority	Dept. of Agriculture & Food	Dept. of Enterprise, Trade & Employment	Enterprise Ireland	Dept. of Community Rural & Gaeltacht Affairs	Dept. of Social & Family Affairs	Dept. of Health & Children	Health Research Board	FAS	Marine Institute	National Roads Authority	Forfás	Grand Total
To:																	
Central & Regional Fisheries Board	149		33												5		187
ESRI		17		151	1	5	8	29		63	2,313	125	183			138	3,033
Higher Education Authority			7,000			9,740		3,075						4,000			23,815
IRCHSS				8,000													8,000
Health Research Board									283								283
Enterprise Ireland							49,823										49,823
IDA Ireland							16,500	3,500									20,000
Shannon Dev.							1,472	3,650									5,122
Teagasc			578			2,760		380									3,718
Science Foundation Ireland							133,751										133,751
Údarás na Gaeltachta								850									850
Grand Total	149	17	7,611	8,151	1	12,505	201,554	11,484	283	63	2,313	125	183	4,000	5	138	248,582

Appendix 4: Departments' and Agencies' Programmes (Attached CD-ROM)

Also available at www.forfas.ie