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# Federal Scientific Activities

2013/2014



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# Federal Scientific Activities

2013/2014

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## Symbols

The following standard symbols are used in Statistics Canada publications:

- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0<sup>s</sup> value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- p preliminary
- r revised
- x suppressed to meet the confidentiality requirements of the *Statistics Act*
- E use with caution
- F too unreliable to be published
- \* significantly different from reference category ( $p < 0.05$ )

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## Highlights

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- Federal departments and agencies reported that they intend on spending \$10.5 billion on science and technology activities (S&T) for fiscal year 2013/2014, down 3.3% from 2012/2013.
- S&T spending comprises two components: research and development (R&D) and related scientific activities (RSA). In 2013/2014, federal government departments and agencies reported that they anticipate spending on R&D to be \$6.8 billion, with RSA accounting for the remaining \$3.7 billion. Examples of related scientific activities include the gathering, processing and analyzing of data, feasibility and policy studies, information services and museum services.
- Extramural expenditures are anticipated by federal departments and agencies to account for approximately half (\$5.3 billion) of expected federal S&T expenditures in 2013/2014. The higher education sector continues to be the leading recipient of federal government extramural S&T spending, receiving 61.5% of total 2013/2014 extramural expenditures.
- In 2013/2014, federal departments and agencies are anticipating that they would employ 35,192 full-time equivalent (FTE) positions engaged in S&T activities. Of this total, 19,052 positions will be classified as scientific and professional, 7,469 as technical and 8,671 as other staff engaged in S&T support activities. Fifty-six percent or 19,845 federal FTE personnel will be engaged in related scientific activities (RSA) (including the administration of extramural RSA programs).

## Analysis

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- Federal departments and agencies reported that they intend on spending \$10.5 billion on science and technology activities (S&T) for fiscal year 2013/2014, down 3.3% from 2012/2013. (table 1, CANSIM table 358-0142)

Federal S&T expenditures are composed of two components: research and development (R&D) and related scientific activities (RSA). Research and development is defined as "creative work, undertaken in a systematic manner to increase the stock of knowledge" (OECD, 2002). Related scientific activities include activities such as scientific data collection, information services, as well as special services and studies, all of which support R&D activities.

- In 2013/2014, the majority, \$6.8 billion or 64%, of federal S&T spending will be dedicated to R&D activities, with the remaining \$3.7 billion directed to RSA. (table 1 )

S&T expenditures are available for two science types: natural sciences and engineering; and social sciences and humanities.

- Federal departments and agencies reported that for 2013/2014 they expect 77% or \$8.0 billion of all federal government S&T spending will be directed to natural sciences and engineering and the rest (\$2.5 billion) will be spent on social sciences and humanities. This proportion has remained fairly stable over time. (table 3, CANSIM table 358-0143)

### **Intramural and Extramural performance of Science and Technology (S&T) activities**

S&T expenditures made within the federal government, such as salaries of scientific personnel and the materials and equipment required to support their activities, are known as intramural expenditures. S&T payments for research and development (R&D) and related scientific activities (RSA) made to other performing sectors, such as higher education, business enterprises, private non-profit organizations, foreign and other entities, are known as extramural expenditures.

- For 2013/2014 federal government departments and agencies anticipate about one half (\$5.2 billion) of their expenditures on S&T activities will be performed within their organization, down 3.0% from the previous year. Over half (53%) of this expenditure, or \$2.7 billion, will be directed to RSA with the remaining \$2.5 billion being spent on R&D. (table 5, CANSIM table 358-0144)

The federal government funds S&T activities through grants, contributions and contracts. Grants or contributions are not intended to secure a particular deliverable, but rather to promote the undertaking of the activity being supported. Contracts, by contrast, are connected to a particular deliverable sought by a department.

- Federal payments to extramural performers, as reported, are expected to decrease 3.6% to \$5.3 billion in 2013/2014. (table 6, CANSIM table 358-0164)
- Almost all of the extramural performers are expected to receive less funding for federal S&T activities in 2013/2014 compared to 2012/2013, with the exception of the business enterprise sector which anticipates a 6.6% increase, resulting primarily from increases in R&D activities. (CANSIM table 358-0144)
- The higher education sector continues to be the leading beneficiary of the federal government's extramural S&T spending and it is expected to receive \$3.3 billion in federal payments for 2013/2014. The second largest recipient of federal extramural S&T spending is the business enterprise sector which is expected to receive \$1.1 billion in 2013/2014. (CANSIM table 358-0144)

## **Federal science and technology (S&T) personnel**

- In 2013/2014, federal departments and agencies reported that they anticipate a total of 35,192 full-time equivalent (FTE) positions engaged in S&T activities. This figure represents a 2.9% decline from 2012/2013 FTE figures. Of these positions, 19,052 (54%) were classified as scientific and professional, 7,469 (21%) as technical and 8,671 (25%) as other positions engaged in support activities. (table 8, CANSIM table 358-0147)
- In 2013/2014, 56% of all federal S&T FTE personnel will be engaged in related scientific activities (RSA) (including the administration of extramural RSA programs). (table 7, CANSIM table 358-0146)

## **Socio-economic objectives of expenditures on research and development (R&D) activities, 2011/2012**

Socio-economic objectives allow departments to classify their S&T resource allocations according to the purpose for which the expenditure is intended. The objectives are based on the Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets produced by the Statistical Office of the European Communities (Eurostat).

- The three most important socio-economic objectives for federal extramural R&D spending in 2011/2012 were: protection and improvement of human health (\$1.4 billion), industrial production and technology (\$799 million) and non-oriented research (\$641 million). Non-oriented research covers basic activities motivated by scientific curiosity with the objective of increasing scientific knowledge. It also includes funding used to support postgraduate studies and fellowships. (table 10, CANSIM table 358-0151)
- In 2011/2012, the three most important socio-economic objectives that tended to be researched within government departments (intramural) were: production, distribution and rational utilization of energy (\$545 million), agriculture (\$354 million) and protection and improvement of human health (\$264 million). (table 10, CANSIM table 358-0151)

## **Federal science and technology (S&T) investment in the regions in 2011/2012**

- In 2011/2012, S&T activities in all Canadian provinces and territories decreased. The only increase in Canada occurred with the largest performing area of federal S&T, the National Capital Region (NCR) of Ontario and Quebec. In 2011/2012 the NCR spending of \$3.5 billion was up 4.5% from the previous year and represented 31% of total S&T expenditures. (table 9, CANSIM table 358-0149)



## Related products

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### Selected publications from Statistics Canada

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88-001-X	Science Statistics
88-202-X	Industrial Research and Development: Intentions
88F0017M	Science, Innovation and Electronic Information Division Research Papers

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### Selected technical and analytical products from Statistics Canada

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88F0017M1999006	Diffusion of Biotechnologies in Canada: Results from the Survey of Biotechnology Use in Canadian Industries
88F0017M2000008	Explaining Rapid Growth in Canadian Biotechnology Firms
88F0017M2001010	Analysis of the Survey on Innovation, Advanced Technologies and Practices in the Construction and Related Industries, 1999
88F0017M2001011	Capacity to Innovate, Innovation and Impact: The Canadian Engineering Services Industry
88F0017M2001012	Patterns of Advanced Manufacturing Technology (AMT) Use in Canadian Manufacturing: 1998 AMT Survey Results

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### Selected CANSIM tables from Statistics Canada

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358-0001	Gross domestic expenditures on research and development, by science type and by funder and performer sector, annual
358-0026	Intellectual property management, by federal departments and agencies indicators, annual
358-0142	Federal expenditures on science and technology and its components in current dollars and 2002 constant dollars, annual
358-0143	Federal expenditures on science and technology and its components, by type of science and performing sector, annual
358-0144	Federal expenditures on science and technology and its components, by activity and performing sector, annual

358-0145	Federal intramural expenditures on science and technology and its components, by type of science for the National Capital Region, annual
358-0146	Federal personnel engaged in science and technology activities, by type of science and personnel category, annual
358-0147	Federal personnel engaged in science and technology and its components, by type of science and personnel category, annual
358-0148	Federal personnel engaged in science and technology and its components, by type of science, personnel category, Canada, provinces and territories, annual
358-0149	Federal expenditures on science and technology and its components, by type of science, performing sector, Canada, provinces and territories, annual
358-0150	Federal extramural expenditures on science and technology and its components, by type of science, performing sector, type of payment, Canada, provinces and territories, annual
358-0151	Federal expenditures on science and technology and its components, by socio-economic objectives, annual
358-0163	Federal expenditures on science and technology, by major departments and agencies
358-0164	Federal extramural expenditures on science and technology, by performing sector and major departments and agencies
358-0165	Federal personnel engaged in science and technological activities, by occupational category and major departments and agencies
358-0166	Federal personnel engaged in science and technological activities, by major departments and agencies

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### **Selected surveys from Statistics Canada**

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4212	Federal Science Expenditures and Personnel, Activities in the Social Sciences and Natural Sciences
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### **Selected summary tables from Statistics Canada**

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- *Domestic spending on research and development (GERD), funding sector, by province*
- *Domestic spending on research and development (GERD), performing sector, by province*
- *Domestic spending on research and development (GERD)*

# Statistical tables

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**Table 1****Federal expenditures – On science and technology, research and development and related scientific activities in current dollars and in constant 2007 dollars**

	Current dollars				Implicit price indexes <sup>2</sup>	Constant 2007 dollars			
	Science and technology					Science and technology			
	Main estimates <sup>1</sup>	Total science and technology	Research and development	Related scientific activities		Main estimates <sup>1</sup>	Total science and technology	Research and development	Related scientific activities
	millions of dollars					millions of dollars			
2001/2002	165,234	8,169	4,989	3,180	84.6	195,312	9,656	5,897	3,759
2002/2003	170,367	8,014	4,927	3,087	85.6	199,027	9,362	5,756	3,606
2003/2004	175,937	8,765	5,462	3,303	88.5	198,799	9,904	6,172	3,732
2004/2005	183,290	8,934	5,454	3,480	91.4	200,536	9,775	5,967	3,807
2005/2006	194,863	9,449	6,042	3,407	94.3	206,642	10,020	6,407	3,613
2006/2007	207,986	9,633	6,073	3,560	96.9	214,640	9,941	6,267	3,674
2007/2008 r	230,772	10,094	6,521	3,573	100.0	230,772	10,094	6,521	3,573
2008/2009 r	241,308	10,491	6,573	3,918	103.9	232,250	10,097	6,326	3,771
2009/2010 r	236,135	11,532	7,374	4,157	101.7	232,188	11,339	7,251	4,088
2010/2011 r	261,200	11,932	7,745	4,187	104.4	250,192	11,429	7,419	4,011
2011/2012 r	250,786	11,313	7,030	4,283	107.7	232,856	10,504	6,527	3,977
2012/2013 r	251,896	10,853	6,802	4,051	109.5	230,042	9,911	6,212	3,700
2013/2014 p	..	10,498	6,761	3,736	..	..	..	..	..

1. Part 1, Government Expenditure Plans, Estimates.

2. CANSIM, table 380-0102.

**Note(s):** Due to rounding, components may not add to the totals.**Table 2****Federal expenditures – On science and technology and its components, by activity**

	2009/2010 <sup>r</sup>	2010/2011 <sup>r</sup>	2011/2012 <sup>r</sup>	2012/2013 <sup>r</sup>	2013/2014 <sup>p</sup>
	millions of dollars				
<b>Total science and technology</b>	<b>11,532</b>	<b>11,932</b>	<b>11,313</b>	<b>10,853</b>	<b>10,498</b>
<b>Total research and development</b>	<b>7,374</b>	<b>7,745</b>	<b>7,030</b>	<b>6,802</b>	<b>6,761</b>
Current expenditures	6,825	7,054	6,518	6,278	6,245
Administration of extramural programs	319	310	314	301	279
Capital	230	381	198	222	238
<b>Total related scientific activities</b>	<b>4,157</b>	<b>4,187</b>	<b>4,283</b>	<b>4,051</b>	<b>3,736</b>
Data collection	2,100	2,113	2,265	2,068	1,892
Information services	734	717	744	725	708
Special services and studies	801	812	815	787	718
Education support	326	329	287	276	265
Administration of extramural programs	83	89	95	88	79
Capital	113	128	77	108	73

**Note(s):** Due to rounding, components may not add to the totals.

**Table 3**  
**Federal expenditures – On science and technology, by science and by performing sector**

	2009/2010 <sup>r</sup>	2010/2011 <sup>r</sup>	2011/2012 <sup>r</sup>	2012/2013 <sup>r</sup>	2013/2014 <sup>p</sup>
	millions of dollars				
<b>Total sciences</b>	<b>11,532</b>	<b>11,932</b>	<b>11,313</b>	<b>10,853</b>	<b>10,498</b>
Federal government (intramural)	5,832	6,059	5,803	5,377	5,215
Business enterprise	1,081	1,201	1,090	1,032	1,100
Higher education	3,107	3,329	3,251	3,310	3,250
Canadian non-profit institutions	439	391	375	404	286
Provincial and municipal governments	486	394	167	114	70
Foreign performers	553	535	595	586	547
Other Canadian performers	33	23	33	31	30
<b>Natural sciences and engineering</b>	<b>8,815</b>	<b>9,161</b>	<b>8,433</b>	<b>8,214</b>	<b>8,043</b>
Federal government (intramural)	4,301	4,483	4,082	3,906	3,872
Business enterprise	1,031	1,125	1,010	952	1,027
Higher education	2,376	2,583	2,528	2,586	2,534
Canadian non-profit institutions	304	270	260	284	196
Provincial and municipal governments	448 <sup>1</sup>	372 <sup>1</sup>	148	96	55
Foreign performers	344	319	391	378	347
Other Canadian performers	11	8	14	13	12
<b>Social sciences and humanities</b>	<b>2,717</b>	<b>2,771</b>	<b>2,881</b>	<b>2,639</b>	<b>2,455</b>
Federal government (intramural)	1,531	1,576	1,721	1,470	1,344
Business enterprise	50	75	80	80	74
Higher education	730	746	724	725	715
Canadian non-profit institutions	135	120	114	120	90
Provincial and municipal governments	38	22	19	18	15
Foreign performers	209	216	203	208	199
Other Canadian performers	22	15	19	18	18

1. Includes \$836 million allocated to S&T activities from the Knowledge Infrastructure Program (KIP), a \$2 billion two-year program which started in 2009/2010.

**Note(s):** As reported by the funder, the federal government, not by the performers. Due to rounding, components may not add to the totals.

**Table 4**  
**Federal expenditures – On science and technology and its components, by activity and performing sector, 2013/2014<sup>p</sup>**

	Federal government (intramural)	Business enterprise	Higher education	Canadian non-profit institutions	Provincial and municipal governments	Foreign performers	Other Canadian performers	Total, all performing sectors
	millions of dollars							
<b>Total science and technology</b>	<b>5,215</b>	<b>1,100</b>	<b>3,250</b>	<b>286</b>	<b>70</b>	<b>547</b>	<b>30</b>	<b>10,498</b>
<b>Total research and development</b>	<b>2,471</b>	<b>903</b>	<b>2,965</b>	<b>180</b>	<b>16</b>	<b>210</b>	<b>17</b>	<b>6,761</b>
In-house research and development	1,672	.	.	.	.	.	.	1,672
Research and development contracts	228	365	23	10	2	18	3	648
Supporting contracts	41	.	.	.	.	.	.	41
Research and development grants and contributions	.	530	2,889	169	14	174	3	3,780
Research fellowships	13	8	53	1	0 <sup>s</sup>	18	11	104
Administration of extramural programs	279	.	.	.	.	.	.	279
Capital	238	.	.	.	.	.	.	238
<b>Total related scientific activities</b>	<b>2,745</b>	<b>198</b>	<b>285</b>	<b>106</b>	<b>53</b>	<b>337</b>	<b>14</b>	<b>3,736</b>
Data collection	1,650	115	14	50	42	17	3	1,892
Information services	651	16	26	10	4	2	0 <sup>s</sup>	708
Special services and studies	290	59	14	44	8	298	5	718
Education support	1	7	231	2	..	20	5	265
Administration of extramural programs	79	.	.	.	.	.	.	79
Capital	73	.	.	.	.	.	.	73

**Note(s):** As reported by the funder, the federal government, not by the performers. Due to rounding, components may not add to the totals.

**Table 5**  
**Federal intramural expenditures – On science and technology and its components, by activity**

	2009/2010	2010/2011	2011/2012 <sup>r</sup>	2012/2013 <sup>r</sup>	2013/2014 <sup>p</sup>
	millions of dollars				
<b>Total science and technology</b>	<b>5,832</b>	<b>6,059</b>	<b>5,803</b>	<b>5,377</b>	<b>5,215</b>
<b>Total research and development</b>	<b>2,762</b>	<b>3,007</b>	<b>2,649</b>	<b>2,437</b>	<b>2,471</b>
Current expenditures	2,212	2,316	2,138	1,914	1,954
Administration of extramural programs	319	310	314	301	279
Capital	230	381	198	222	238
<b>Total related scientific activities</b>	<b>3,070</b>	<b>3,052</b>	<b>3,154</b>	<b>2,940</b>	<b>2,745</b>
Data collection	1,895	1,884	2,009	1,803	1,650
Information services	654	640	676	656	651
Special services and studies	323	311	296	284	290
Education support	2	1	1	1	1
Administration of extramural programs	83	89	95	88	79
Capital	113	128	77	108	73

**Note(s):** Due to rounding, components may not add to the totals.

**Table 6**  
**Federal extramural expenditures – On science and technology and its components, by performing sector**

	2009/2010 <sup>r</sup>	2010/2011 <sup>r</sup>	2011/2012 <sup>r</sup>	2012/2013 <sup>r</sup>	2013/2014 <sup>p</sup>
	millions of dollars				
<b>Total science and technology</b>	<b>5,700</b>	<b>5,873</b>	<b>5,510</b>	<b>5,477</b>	<b>5,282</b>
Business enterprises	1,081	1,201	1,090	1,032	1,100
Higher education	3,107	3,329	3,251	3,310	3,250
Canadian non-profit institutions	439	391	375	404	286
Provincial and municipal governments	486 <sup>1</sup>	394 <sup>1</sup>	167	114	70
Foreign performers	553	535	595	586	547
Other Canadian performers	33	23	33	31	30
<b>Research and development</b>	<b>4,612</b>	<b>4,738</b>	<b>4,381</b>	<b>4,365</b>	<b>4,291</b>
Business enterprises	868	968	860	823	903
Higher education	2,765	2,983	2,944	3,013	2,965
Canadian non-profit institutions	275	221	227	239	180
Provincial and municipal governments	448 <sup>1</sup>	366 <sup>1</sup>	121	50	16
Foreign performers	239	186	210	222	210
Other Canadian performers	17	13	19	17	17
<b>Related scientific activities</b>	<b>1,087</b>	<b>1,135</b>	<b>1,129</b>	<b>1,111</b>	<b>992</b>
Business enterprises	213	233	230	209	198
Higher education	341	346	307	297	285
Canadian non-profit institutions	164	170	148	164	106
Provincial and municipal governments	38 <sup>1</sup>	28 <sup>1</sup>	46	64	53
Foreign performers	315	349	385	364	337
Other Canadian performers	16	9	14	13	14

1. Includes \$836 million allocated to S&T activities from the Knowledge Infrastructure Program (KIP), a \$2 billion two-year program which started in 2009/2010.

**Note(s):** As reported by the funder, the federal government, not by the performers. Due to rounding, components may not add to the totals.

**Table 7**  
**Federal personnel – Engaged in science and technology activities**

	2009/2010	2010/2011	2011/2012 <sup>r</sup>	2012/2013 <sup>r</sup>	2013/2014 <sup>p</sup>
	number				
<b>Total sciences</b>	<b>38,968</b>	<b>38,594</b>	<b>39,189</b>	<b>36,231</b>	<b>35,192</b>
Research and development	15,110	15,011	14,876	13,892	13,443
Administration of extramural research and development programs	2,162	2,072	2,086	1,949	1,904
Related scientific activities	20,983	20,759	21,455	19,684	19,215
Administration of extramural related scientific activities programs	713	753	772	706	630
<b>Natural sciences and engineering</b>	<b>27,340</b>	<b>27,073</b>	<b>27,163</b>	<b>26,390</b>	<b>25,707</b>
Research and development	13,981	13,616	13,966	13,061	12,623
Administration of extramural research and development programs	1,745	1,711	1,715	1,619	1,587
Related scientific activities	11,223	11,308	11,004	11,250	11,083
Administration of extramural related scientific activities programs	392	438	478	462	414
<b>Social sciences and humanities</b>	<b>11,628</b>	<b>11,521</b>	<b>12,026</b>	<b>9,840</b>	<b>9,485</b>
Research and development	1,129	1,394	910	831	820
Administration of extramural research and development programs	417	361	372	331	317
Related scientific activities	9,760	9,451	10,451	8,434	8,132
Administration of extramural related scientific activities programs	321	315	294	245	216

**Note(s):** Personnel counts are reported as full-time equivalents. Due to rounding, components may not add to the totals.

**Table 8**  
**Federal personnel – Engaged in science and technology activities, by category and activity**

	2009/2010	2010/2011	2011/2012 <sup>r</sup>	2012/2013 <sup>r</sup>	2013/2014 <sup>p</sup>
	number				
<b>Total science and technology</b>	<b>38,968</b>	<b>38,594</b>	<b>39,189</b>	<b>36,231</b>	<b>35,192</b>
Scientific and professional personnel	17,896	20,341	20,489	19,542	19,052
Technical personnel	9,577	8,255	8,055	7,657	7,469
Other personnel	11,495	9,998	10,645	9,032	8,671
<b>Research and development</b>	<b>17,272</b>	<b>17,082</b>	<b>16,962</b>	<b>15,841</b>	<b>15,347</b>
Scientific and professional personnel	7,667	8,010	7,854	7,416	7,230
Technical personnel	5,166	4,900	4,761	4,514	4,374
Other personnel	4,439	4,172	4,347	3,911	3,743
<b>Related scientific activities</b>	<b>21,696</b>	<b>21,512</b>	<b>22,227</b>	<b>20,390</b>	<b>19,845</b>
Scientific and professional personnel	10,229	12,331	12,635	12,126	11,822
Technical personnel	4,411	3,355	3,294	3,143	3,095
Other personnel	7,056	5,826	6,298	5,121	4,928

**Note(s):** Personnel counts are reported as full-time equivalents. Due to rounding, components may not add to the totals.

**Table 9**  
**Federal expenditures by province and territories – On science and technology**

	2007/2008 <sup>r</sup>	2008/2009 <sup>r</sup>	2009/2010 <sup>r</sup>	2010/2011 <sup>r</sup>	2011/2012 <sup>r</sup>
	millions of dollars				
Canada and foreign	10,094	10,491	11,532	11,932	11,313
Canada	9,649	9,935	10,978	11,397	10,719
Newfoundland and Labrador	126	118	138	127	102
Prince Edward Island	41	53	45	49	45
Nova Scotia	307	317	377	337	277
New Brunswick	130	111	151	131	111
Quebec <sup>1</sup>	1,517	1,623	1,751 <sup>2</sup>	1,825	1,670
Ontario <sup>1</sup>	2,300	2,466	2,910	3,093	2,598
Manitoba	266	306	368	355	321
Saskatchewan	193	216	249	248	224
Alberta	471	515	613	691	578
British Columbia	822	730	920	924	886
Yukon, Northwest Territories and Nunavut	42	51	62	104	67
National Capital Region, Ontario/Quebec <sup>3</sup>	2,922	3,104	3,191 <sup>2</sup>	3,305	3,455
Unallocated (within Canada)	511	324	201	208	384
Foreign (outside Canada)	445	556	553	535	595

1. Includes the extramural expenditures of the National Capital Region.

2. This value has been revised due to a redistribution of personnel from the National Capital Region (Quebec) to the National Capital Region (Ontario) and Quebec (excluding the National Capital Region).

3. Federal intramural expenditures only.

**Note(s):** Due to rounding, components may not add to the totals.

**Table 10**  
**Federal expenditures by socio-economic objectives – On research and development**

	2009/2010 <sup>r</sup>		2010/2011 <sup>r</sup>		2011/2012 <sup>r</sup>	
	Intramural <sup>1</sup>	Extramural	Intramural <sup>1</sup>	Extramural	Intramural <sup>1</sup>	Extramural
	millions of dollars					
<b>Total socio-economic objectives</b>	<b>2,628</b>	<b>4,612</b>	<b>2,863</b>	<b>4,738</b>	<b>2,520</b>	<b>4,381</b>
Exploration and exploitation of the earth	95	87	90	77	86	92
Infrastructure and general planning of land use						
Transport	63	55	64	56	60	58
Telecommunication	48	43	46	52	41	35
Other infrastructure and general planning of land use	44	32	44	76	42	37
Control and care of the environment	207	223	200	227	208	225
Protection and improvement of human health	274	1,361	280	1,432	264	1,416
Production, distribution and rational utilization of energy	544	164	717	269	545	257
Agricultural production and technology						
Agriculture	390	213	360	179	354	154
Fishing	8	26	7	29	7	21
Forestry	66	62	70	90	69	58
Industrial production and technology	227	843	206	801	182	799
Social structures and relationships	106	232	156	222	125	243
Exploration and exploitation of space	81	197	78	228	74	268
Non-oriented research	254	990	247	938	240	641
Other civil research	23	5	21	4	14	2
Defence	198	79	276	57	211	76
Other socio-economic objectives	..	..	..	..	..	..

1. Non-program (indirect) costs are excluded.

**Note(s):** Due to rounding, components may not add to the totals.



## Bibliography

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Organization for Economic Cooperation and Development (OECD). 2002. *Frascati Manual* (6th ed.). OECD: Paris.

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## Methodology

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The Federal Government is a principal funder of science and technology in Canada. This report presents information on the disposition of monies and human resources for science and technology (S&T) by federal departments and agencies. The information has been assembled to serve as a reference document for program managers, government officials, the media and the general public. It records the allocation of S&T resources for the last five years.

The statistics are collected through the survey of Federal Science Expenditures and Personnel, which records past, current and preliminary expenditures for activities in the natural and social sciences. The survey is designed to correspond as much as possible to the system of budgetary estimates used by the federal government. This is done to ease the response burden, assist in editing and, most importantly, to produce comparable data for policy planning and program evaluation. Thus, the questionnaire covers the same time span as the estimates including: actual expenditures for the past fiscal year, e.g., 2010/2011; forecast expenditures for the current fiscal year, e.g., 2011/2012; and proposed estimates for the fiscal year, e.g., 2012/2013 (as also reported in the Public Accounts).

Sixty-seven different federal government departments and agencies either perform science and technology (S&T) activities or have a budgetary allocation to fund S&T. In addition to the expenditures attributable to program budgets, there are additional costs attributable to scientific activities which must be included if a full picture of the resources devoted to science activities is to be obtained. These include other sources of funds and other S&T costs which are defined below:

Transfers into the program from other federal government departments and agencies, net of transfers out;

Income from external sources such as industry and provincial governments;

Other S&T costs: Non-program costs (indirect costs) are costs that are not part of the budgets of scientific programs and include services provided by other departments, such as:

- accommodation by Public Works and Government Services Canada and own department;
- employer's share of health and employment insurance premiums paid by Treasury Board;
- employee compensation under Workers Compensation Acts paid by Human Resources and Social Development Canada;
- cost of legal services provided by the Department of Justice;
- cheques issue cost by Public Works and Government Services Canada.

Indirect costs are included in departmental totals; however, these costs have not been included in expenditures classified by socio-economic objective.

According to international convention, science and technology activities are divided into two fields; natural sciences and engineering (NSE) and social sciences and humanities (SSH). These fields of science are further divided into research and development (R&D) and related scientific activities (RSA). The Federal Government may choose to perform S&T in its own laboratories (intramural expenditures) or may pay another organization to perform S&T (extramural expenditures). Data are presented in this article on S&T activities funded by the federal government for R&D and RSA and distinguished by performer (that is, intramurally by the government itself or extramurally, by business enterprises (industry), higher education, provincial and municipal governments, Canadian non-profit organizations, other Canadian performers and foreign performers). Definitions of these terms are provided in the Technical Notes section. Crown corporations which have an industrial function are not included. They are treated as commercial enterprises and the crown corporation expenditures in aggregate are included in the Statistics Canada report, Industrial Research and Development, Catalogue No. 88-202-X

Considerable effort has been expended to maintain the continuity and compatibility of the data series to permit analysis and study of the impact of scientific activities. Efforts of the departments and agencies in ensuring accurate and complete information are gratefully acknowledged.

# Technical notes

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## Scope and limitations of the data

The expenditures data for scientific activities controlled by federal departments and agencies provided in this document correspond to the budgetary expenditures by program presented in Main Estimates for the approval of Parliament. The following kinds of non-budgetary costs or expenditures are not included:

- loans or advances to and investments in Crown Corporations; loans or advances for specific purposes to other governments and international organizations or persons or corporations in the private sector.

## Reliability of the data

All the possible sources of error were examined. Definitions have been taken from a compendium of methods of error evaluation in censuses and surveys, Statistics Canada, catalogue no. 13-564-X.

- A complete enumeration is carried out of all federal departments and agencies involved in scientific activities.
- Being a census, coverage and non-response are very minor causes of error.
- No imputation, coding, or sampling is done by Statistics Canada for this exercise.

## Data capture

The data capture operation in a census or survey consists of converting the data received on questionnaires (e.g., respondent answers) or coding forms to a machine readable format.

All data capture for science statistics is through manual intervention, at a computer terminal.

Significant uncorrected data capture errors are unlikely because of the examination of numerous tables and listings prepared for data analysis before publication tables are created. Mistakes in expenditures due to coding error are believed to be less than 1%.

## Edit

The edit procedures usually consist of:

- checking each field of every record to ascertain whether it contains a valid code or entry;
- checking codes or entries in certain predetermined combinations of fields to ascertain whether codes or entries are consistent with one another. Although there are a number of edits, all cases of failed edit checks are corrected after consideration by editors.

# Definitions

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## Scope and limitations of the data

According to international convention, science and technology activities are divided into two fields; natural sciences and engineering (NSE) and social sciences and humanities (SSH). These fields of science are further divided into research and development (R&D) and related scientific activities (RSA). The federal government may choose to perform S&T in its own laboratories (intramural expenditures) or may pay another organization to perform S&T (extramural expenditures). Data are presented in this article on S&T activities funded by the federal government for R&D and RSA and distinguished by performer (that is, intramurally by the government itself or extramurally, by business enterprises (industry), the higher education sector, provincial and municipal governments, Canadian non-profit organizations, other performers and foreign performers).

## Definitions applicable to both Natural sciences and engineering and Social science and humanities

### Scientific research and experimental development (R&D)

Creative work undertaken on a systematic basis in order to increase the stock of scientific and technical knowledge and to use this knowledge in new applications.

The central characteristic of R&D is an appreciable element of novelty and of uncertainty. New knowledge, products or processes are sought. New knowledge involves the integration of newly acquired information into existing hypotheses, the formulation and testing of new hypotheses or the re-evaluation of existing observations.

An R&D project generally has three characteristics:

- a substantial element of uncertainty, novelty and innovation;
- a well-defined project design; and
- a report on the procedures and results of the projects.

### Related scientific activities (RSA)

Those activities which complement and extend R&D by contributing to the generation, dissemination and application of scientific and technological knowledge.

### Intramural performance

Where the science and technology (S&T) activities are managed and carried out primarily by federal government employees, they are classified as intramural S&T. Even where major components of the project are provided by outside agencies, such as computer services, laboratory construction, testing of prototype equipment, if the planning, supervision, reporting, and key operating functions are performed by federal personnel, then the activity is considered to be intramural. This also applies to S&T activities carried out by a department or agency on behalf of another federal department or agency on a cost recovery basis.

The intramural expenditures reported for scientific activities are those direct costs, including salaries, associated with scientific programs. These costs include that portion of a program's contribution to employee benefit plans (e.g., superannuation) which is applicable to the scientific personnel within the program.

Non-program ("indirect") costs, such as the value of services provided by other departments without charge, are to be excluded. Support services (i.e., administration, finance) provided by the reporting program, proportional to S&T expenditures should be included.

### **Extramural performance**

The management and conduct of an S&T activity is entrusted to a non-federal organization. The six extramural performance sectors used in surveying S&T expenditures by the federal government are:

#### **Business enterprise**

This sector is composed of business and government enterprises, including public utilities and government-owned firms. Incorporated consultants providing scientific and engineering services are also included. Industrial research institutes located at Canadian universities are considered to be in the Higher education sector.

#### **Higher education**

This sector is composed of all universities, colleges of technology and other institutes of post-secondary education, whatever their source of finance or legal status. It also includes all research institutes, experimental stations and clinics operating under the direct control of, or administered by, or associated with, the higher education establishments.

#### **Canadian non-profit institutions**

Charitable foundations, voluntary health organizations, scientific and professional societies, and other organizations not established to earn profits comprise this sector. Canadian non-profit institutions primarily serving or controlled by another sector should be included in that sector.

#### **Provincial and municipal governments**

Departments and agencies of these governments form this sector. Government enterprises, such as provincial utilities are included in the Business enterprise sector, and hospitals in the Canadian non-profit institutions.

#### **Foreign performers**

All foreign government agencies, foreign companies (including foreign subsidiaries of Canadian firms), international organizations, non resident foreign nationals and Canadians studying or teaching abroad, are included in this sector.

#### **Other performers**

This sector includes provincial research councils, and individuals or organizations in Canada not belonging to any of the above sectors.

### **Type of payment**

#### **Contracts**

These are payments to organizations or individuals outside the federal government for the conduct of S&T by the recipient or to provide support for the federal government's in-house S&T programs.

#### **Grants and contributions**

Awards to organizations or individuals for the conduct of S&T and intended to benefit the recipients rather than provide the program with goods, services or information.

#### **Research fellowships**

Awards to individuals for advanced research training and experience. Awards intended primarily to support the education of the recipients are reported as education support.

## Socio-economic objectives

Socio-economic objectives allow departments to classify their S&T resource allocations according to the purpose for which the expenditure is intended. The objectives are listed on the questionnaire at the highest level of aggregation with sub-levels given for clarification of categories. In many cases, projects have multiple objectives and a department should assign its expenditures consistent with the stated objectives of the department. Care must be taken to avoid “double counting”.

The objectives are based on the Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets (NABS) produced by the Statistical Office of the European Communities (Eurostat).

- **Exploration and exploitation of the Earth**

Scientific activities with objectives related to the exploration of the Earth’s crust and mantle, seas, oceans and atmosphere, and scientific activities on their exploitation. It also includes climatic and meteorological research, polar exploration and hydrology.

- **Infrastructure and general planning of land use**

Scientific activities on infrastructure and land development, including research on the construction of buildings. More generally, it covers all scientific activities relating to the general planning of land-use. This includes scientific activities into protection against harmful effects in town and country planning but not scientific activities into other types of pollution.

- **Control and care of the environment**

Covers scientific activities into the control of pollution, aimed at the identification and analysis of the sources of pollution and their causes, and all pollutants, including their dispersal in the environment and the effects on man, species (fauna, flora, microorganisms) and biosphere. Development of monitoring facilities for the measurement of all kinds of pollution is included. The same is valid for the elimination and prevention of all forms of pollution in all types of environment.

- **Protection and improvement of human health**

Scientific activities aimed at protecting, promoting and restoring human health broadly interpreted to include health aspects of nutrition and food hygiene. It ranges from preventative medicine, including all aspects of medical and surgical treatment, both for individuals and groups, and the provision of hospital and home care, to social medicine and pediatric and geriatric research.

- **Production, distribution and rational utilization of energy**

Covers scientific activities into the production, storage, transportation, distribution and rational use of all forms of energy. It also includes scientific activities on processes designed to increase the efficiency of energy production and distribution, and the study of energy conservation.

- **Agricultural production and technology**

Covers all scientific activities on the promotion of agriculture, forestry, fisheries and foodstuff production. It includes: scientific research on chemical fertilizers, biocides, biological pest control and the mechanization of agriculture; research on the impact of scientific activities in the field of developing food productivity and technology.

- **Industrial production and technology**

Covers scientific activities on the improvement of industrial production and technology. It includes scientific activities on industrial products and their manufacturing processes except where they form an integral part of the pursuit of other objectives (e.g., defence, space, energy, agriculture).

- **Social structures and relationships**

Scientific activities on social objectives, as analysed in particular by social and human sciences, which have no obvious connection with other objectives. This analysis includes quantitative, qualitative, organizational and forecasting aspects of social problems.

- **Exploration and exploitation of space**

All civil space scientific activities. Corresponding scientific activities in the defence field is classified in the Defence objective. (Although civil space research is not, in general, concerned with particular objectives, it frequently has a specific goal, such as the increase of general knowledge (e.g., astronomy), or relates to particular applications (e.g., telecommunications satellites).

- **Non-oriented research**

Basic activities motivated by scientific curiosity with the objective of increasing scientific knowledge. It also includes funding used to support postgraduate studies and fellowships.

- **Other civil research**

Civil scientific activities which cannot (yet) be classified to a particular objective.

- **Defence**

Covers scientific activities for military purposes. It also includes basic research and nuclear and space research financed by ministries of defence. Civil scientific activities financed by ministries of defence, for example, in the fields of meteorology, telecommunications and health, should be classified in the relevant objectives.

## **Personnel**

Intramural expenditure data should be supported by data on the personnel devoted to scientific activities by all the employees engaged in these activities.

## **Scientific and professional**

People in jobs that require at least one academic degree or nationally recognized professional qualification, as well as those with equivalent experience.

## **Technical**

People in jobs that require specialized vocational or technical training beyond the secondary level (e.g., community colleges and technical institutes) as well as those with experience equivalent to this training.

## **Other**

Clerical, secretarial, administrative, operational and other support personnel.

In regard to personnel resources, there are two caveats:

- where the S&T activities are a part of the program being reported, only the auxiliary staff relevant to the S&T activities are reported on a prorated basis; and
- whenever financial and administrative support is provided from another program, that support is allocated to the S&T resources for the program being reported.

## **Full-time equivalent (FTE)**

A measure of the time actually devoted to the conduct of scientific activities. An employee who is engaged in scientific activities for a half a year has a full-time equivalence of 0.5. Personnel data reported should be consistent with expenditure data.



### **Administration of extramural programs (AEP)**

AEP identifies the FTEs engaged in the administration of contracts and grants and contributions for scientific activities that are to be performed outside the federal government. These FTEs are broken down by the type of scientific activity supported, i.e., R&D or RSA.

### **Definitions specific to natural sciences and engineering**

The natural sciences and engineering (NSE) field consists of disciplines concerned with understanding, exploring, developing or utilizing the natural world. Included are the engineering, mathematical, life and physical sciences.

### **Related scientific activities (RSA)**

The kinds of related scientific activities for the natural sciences are described below.

#### **Scientific data collection**

The gathering, processing, collating and analyzing of data on natural phenomena. These data are normally the results of surveys, routine laboratory analyses or compilations of operating records.

Data collected as part of an existing or proposed R&D project are charged to research. Similarly, the costs of analyzing existing data as part of a research project are R&D costs, even when the data were originally collected for some other purpose. The development of new techniques for data collection is also to be considered to be a research activity. Examples of scientific data collection are: routine geological, hydrographic, oceanographic and topographic surveys; routine astronomical observations; maintenance of meteorological records; and wildlife and fisheries surveys.

#### **Information services**

All work directed to recording, classifying, translating and disseminating scientific and technological information as well as museum services. Included are the operations of scientific and technical libraries, S&T consulting and advisory services, the Patent Office, the publication of scientific journals and monographs, and the organizing of scientific conferences. Grants for the publication of scholarly works are also included.

General purpose information services or information services directed primarily towards the general public are excluded, as are general departmental and public libraries. When individual budgets exist, the costs of libraries which belong to institutions otherwise entirely classified to another activity, such as R&D, should be assigned to information services. The costs of printing and distributing reports from another activity, such as R&D, are normally attributable to that activity.

#### **Sub category under 'Information services'**

- **Museum services**

The collecting, cataloguing, and displaying of specimens of the natural world or of representations of natural phenomena. The activity involves a systematic attempt to preserve and display items from the natural world; in some ways it could be considered an extension of information services. The scientific activities of natural history museums, zoological and botanical gardens, aquaria, planetaria and nature reserves are included. Parks which are not primarily restricted reserves for certain fauna or flora are excluded. In all cases the costs of providing entertainment and recreation to visitors should be excluded (e.g. restaurants, children's gardens and museums).

When a museum also covers not only natural history but also aspects of human cultural activities, the museum's resources should be appropriated between the natural and social sciences. However, museums of science and technology, war, etc., which display synthetic or artificial objects and may also illustrate the operations of certain technologies, should be considered as engaged in museum services in social sciences.

### **Special services and studies**

Work directed towards the establishment of national and provincial standards for materials, devices, products and processes; the calibration of secondary standards; non-routine quality testing; feasibility studies and demonstration projects.

#### **Sub categories under 'Special services and studies' include:**

- **Testing and standardization**

Work directed towards the establishment of national and international standards for materials, devices, products and processes, the calibration of secondary standards and non-routine quality testing. The development of new measures for standards, or of new methods of measuring or testing, is R&D and should be reported as such. Exclude routine testing such as monitoring radioactivity levels or soil tests before construction.

- **Feasibility studies**

Technical investigations of proposed engineering projects to provide additional information required to reach decisions on implementation. Besides feasibility studies per se, the related activity of demonstration projects are to be included. Demonstration projects involve the operation of scaled-up versions of a facility or process, or data on factors such as costs, operational characteristics, market demand and public acceptance. Projects called 'demonstration projects' but which conform to the definition of R&D should be considered R&D. Once a facility or process is operated primarily to provide a service or to gain revenue, rather than as a demonstration, it should no longer be included with feasibility studies. In all demonstration projects, only the net costs should be considered.

### **Education support**

Grants to individuals or institutions on behalf of individuals which are intended to support the post-secondary education of students in technology and the natural sciences. General operating or capital grants are excluded. The activity includes the support of foreign students in their studies of the natural sciences at Canadian or foreign institutions. Grants intended primarily to support the research of individuals at universities are either R&D grants or research fellowships.

### **Definitions specific to Social sciences and humanities**

The social sciences and humanities (SSH) field embraces all disciplines involving the study of human actions and conditions and the social, economic and institutional mechanisms affecting humans. Included are such disciplines as anthropology, business administration and commerce, information and knowledge management, criminology, demography, economics, geography, history, languages, literature and linguistics, law, library science, philosophy, political science, psychology, religious studies, social work, sociology, and urban and regional studies.

### **Related scientific activities (RSA)**

The kinds of related scientific activities for the social sciences and humanities are described below.

### General purpose data collection

The routine gathering, processing, collating, analysis and publication of information on human phenomena using surveys, regular and special investigations and compilations of existing records. It excludes data collected primarily for internal administrative purposes (e.g., departmental personnel statistics) as well as the collection of data as part of an R&D project.

Data collected as part of an existing or proposed research project are charged to research. Similarly the costs of analyzing existing data as part of a research project are R&D costs, even when the data were originally collected for some other purpose. The development of new techniques for data collection is also considered a research activity. The institutions involved are generally the statistical bureaus of Canadian governments and the statistical sections of departments and agencies. If there are units whose principal activity is R&D, their costs and personnel should be assigned to R&D; specialized libraries with separate budgets should be assigned to information services.

### Information services

All work related to recording, classifying, translating and disseminating scientific and technological information as well as museum services. Included are the operations of scientific and technical libraries, S&T consulting and advisory services, the Patent Office, the publication of scientific journals and monographs, and the organizing of scientific conferences. Grants for the publication of scholarly works are also included.

General purpose information services or information services directed primarily towards the general public are excluded, as are general departmental and public libraries. When individual budgets exist, the costs of libraries which belong to institutions otherwise entirely classified to another activity, such as R&D, should be assigned to information services. The costs of printing and distributing reports from another activity, such as R&D, are normally attributable to that activity.

### Sub category under 'Information services' include:

- **Museum services**

The collecting, cataloguing, and displaying of specimens and representations relating to human history, social organization and creations. The activity involves a systematic attempt to preserve and display the works of human beings and to provide information on their works, history, and nature. The scientific activities of historical museums, archaeological displays, and art galleries are included. In all cases, the costs of providing entertainment and recreation to visitors should be excluded (e.g. restaurants, children's gardens and museums).

When a museum also covers aspects of natural history, the museum's operation should be divided between the social and natural sciences. However, museums of science and technology, war, etc., which display synthetic or artificial objects and may also illustrate the operations of certain technologies, should be considered as engaged in museum services in social sciences.

### Special services and studies

Systematic investigations carried out in order to provide information needed for planning or policy formulation. Demonstration projects are also included.

The work is usually carried out by specialized units in some government departments, by consultants, by royal commissions, and by task forces. The activity is similar to R&D since it may require innovative analyses and a high degree of scientific ability. However, such studies are not intended to acquire new knowledge but to provide specific answers to specific problems (generally immediate, localized and perhaps temporary). The day-to-day operations of units concerned with departmental planning, organization or management are not normally included (i.e. administrative records kept by departments of education) but special projects may be relevant.

**Sub categories under ‘Special services and studies’ include:**

- **Economic and feasibility studies**

Investigations of the socio-economic characteristics and implications of specific situations. Such studies are generally limited to a specific problem and involve the application of established social science techniques and methodologies.

- **Operations and policy studies**

The analysis and assessment of departmental programs, policies and operations, the activities of units concerned with the continuing analysis and monitoring of external phenomena (e.g., foreign economic statistics, defence and security information) as well as studies to provide an information base for policy development. The work is carried out by specialized units in some government departments, by consultants, by royal commissions and by task forces.

**Education support**

Grants to individuals or institutions on behalf of individuals which are intended to support the post-secondary education of students in technology and the social sciences. General purpose grants to educational institutions are excluded. The activity includes the support of foreign students in their studies of the social sciences at Canadian or foreign institutions. Grants intended primarily to support the research of individuals at universities are either R&D grants or research fellowships.