

# Science and Technology Indicators

2009 NORWAY



# Introduction

This booklet, containing tables and figures on R&D statistics and science and technology indicators, has been published annually since 1997. A broader coverage of S&T input and output data is published in the *Report on Science and Technology Indicators for Norway 2007*, *The Norwegian Research Council, Oslo, 2008*. The internet version of the report is updated with statistics for 2007, and from 2009, the paper version will be issued annually. You may also find information at [www.foustatistikkbanken.no](http://www.foustatistikkbanken.no). All expenditures are given in current prices, unless otherwise indicated. 1.00 PPP US\$ = 8.91 NOK in 2007 (Main Science and Technology Indicators 2008-2, OECD), by June 2009 1 Euro = 8.8 NOK.

## Who prepares the R&D statistics?

NIFU STEP and Statistics Norway carry out the statistical surveys on resources devoted to R&D in Norway. NIFU STEP is responsible for collecting, processing and disseminating statistics and indicators regarding the Institute sector, see classification on page four, and the Higher education sector, while Statistics Norway is responsible for the Industrial sector. NIFU STEP is also responsible for compiling the information into national totals for Norway. For the Industrial and Institute sectors, and the health trusts, annual statistical surveys are carried out. For the Higher education sector the survey is carried out every second year. For all sectors main figures are presented annually. Further information may be found at [www.nifustep.no](http://www.nifustep.no), with links to the report mentioned above, and at the web sites of The Research Council of Norway ([www.rcn.no](http://www.rcn.no)) and Statistics Norway ([www.ssb.no/english](http://www.ssb.no/english)).

## How are R&D statistics compiled?

Norwegian R&D statistics are compiled in accordance with the international guidelines proposed by the OECD in the «Frascati Manual» (*The Measurement of Scientific and Technological activities: Proposed Standard Practice for Surveys on Research and Experimental Development «Frascati Manual 2002»*, OECD 2002). The sections of this manual dealing with basic definitions and conventions of R&D have been translated into Norwegian by NIFU STEP (2004). R&D statistics for Norway are based on administrative registers and questionnaires sent to the R&D performing units in each sector.

The survey on R&D activity in the **Industrial sector** contains all companies with 50 or more employees. In addition, the survey includes a sample of companies with a minimum of 10 employees. Prior to 1995, the survey only included companies with 50 or more employees. Statistics on the Industrial sector from 1995 onwards are therefore not comparable with previous years.

The **Higher education sector** is thoroughly surveyed. Each individual department or corresponding equivalent unit is surveyed. Supplementary sources of information include surveys on staff time distribution, information on personnel and expenditure from the higher education institutions' central administration, the Research Council of Norway, and medical foundations.

The **Institute sector** is also covered by full scale surveys. Questionnaires are sent to research institutes and other institutions that are expected to perform R&D activities. R&D performed at museums are estimated. Statistics on R&D resources in **health trusts**, i.e. university hospitals and other hospitals, are collected through a separate, national reporting system. Starting with the 2007 edition, the reporting system is being integrated with national R&D statistics. In R&D statistical presentations, and in international R&D statistics, university hospitals are included in the Higher education sector, while non-university hospitals are included in the Government sector/Institute sector.

#### **Other data sources:**

Statistics on **R&D personnel** in the Higher education and Institute sectors are based on NIFU STEP's Register of Research personnel. The register is updated annually. **International R&D statistics** are extracted from the OECD's *Main Science and Technology Indicators*. Information about doctoral students and awarded doctoral degrees in the Nordic and Baltic countries is from **NORBAL**, a database operated by NIFU STEP on commission from NordForsk. The **doctoral degree statistics** are based on NIFU STEP's Norwegian doctoral degree register, which is updated biannually. **Bibliometric data** are extracted from *National Citation Report* for Norway prepared by Thomson Reuters in the U.S.

## Basic definitions of Research and experimental development (R&D)

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

Three types of R&D may be distinguished:

- **Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- **Applied research** is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- **Experimental development** is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

### Sector classification

In Norwegian R&D statistics, resources are classified in three performing sectors: *The Industrial sector*, *the Higher education sector*, and *the Institute sector*. OECD's Higher education sector corresponds to the Norwegian definition. For international comparisons, *Business enterprise sector* includes the Industrial sector as well as non-profit research institutes serving enterprises. In national statistics, these business-oriented research institutes are included in the Institute sector, which also covers *Government sector* and *Private Non-Profit sector (PNP)*. The PNP sector is rather small in Norway, and is therefore included in the Government sector in international statistics presentations.

## Highlights

- Total R&D expenditure in Norway amounted to 37.4 bill. NOK in 2007, an increase from 32.8 bill. NOK in 2006.
- R&D expenditure accounted for 1.64 per cent of the Gross Domestic Product (GDP) in 2007.
- Norway spent 7 950 NOK per capita on R&D in 2007, compared to 8 640 and 11 920 NOK respectively in Denmark and Sweden.
- Portugal, Norway, Spain and Iceland had the highest share of government funded R&D in 2007, while Japan, Germany, Sweden and the USA had the highest industry funding rate.
- Oslo and Akershus was the region with the highest R&D expenditure per capita, 14 680 NOK, followed by Middle Norway with 10 580 NOK.
- Energy and environment was the largest thematic priority in 2007. R&D expenditure within this field amounted to 7.7 bill. NOK, of which 4.0 bill. NOK was research related to Petroleum and 0.6 bill. NOK to Climate.
- Information- and communication technology (ICT) was the largest technology area, with R&D expenditure of 7.9 bill. NOK. ICT was also the largest technology area in 2005.
- In 2007, R&D expenditure in the Industrial sector amounted to 17.4 bill. NOK, of which three quarters was the sector's own funds.
- Approximately 4 per cent of the current expenditure in Norwegian university hospitals was spent on R&D in 2007, while the share in non-university hospitals was 0.6 per cent.
- 59 600 persons participated in R&D in Norway in 2007 performing 34 000 full time equivalents (FTE).
- 41 800 researchers participated in R&D in 2007. Of these, 33 per cent were women, and the share of women was highest at the state university colleges, with 49 per cent. 27 per cent of the researchers held a doctorate.
- Finland had the highest share of doctoral students per mill. capita in the Nordic and Baltic countries in 2007, and also had the largest increase from 2006 to 2007. In Sweden, the number of doctoral students decreased from 2003 to 2007. In Norway there has been a steady growth in the period.
- In 2007, 1 244 doctoral degrees were awarded at Norwegian higher education institutions, an increase of 200 degrees from the previous year. The share of female doctorates was 45 per cent both in 2007 and 2008.
- The number of Norwegian journal articles with an international co-authorship has increased more than the number of Norwegian journal articles without a co-authorship during the past three years.

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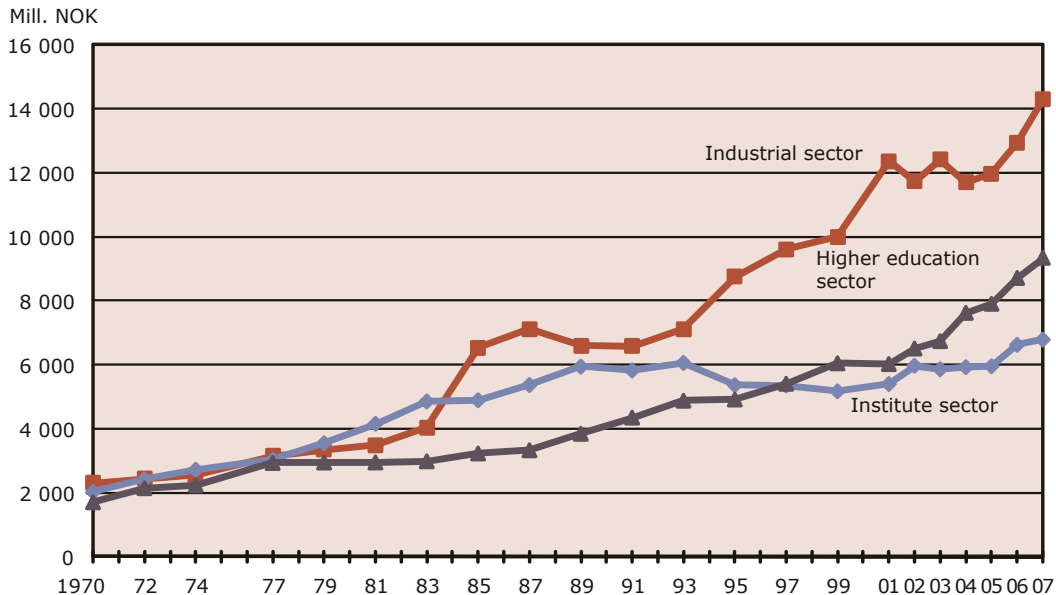
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**Figure 1 R&D expenditure in Norway by sector of performance: 1970–2007. Fixed 2000-prices.**



Source: R&D statistics, NIFU STEP/Statistics Norway

**Table 1 R&D expenditure in Norway by sector of performance and source of funds: 2007.  
Mill. NOK.**

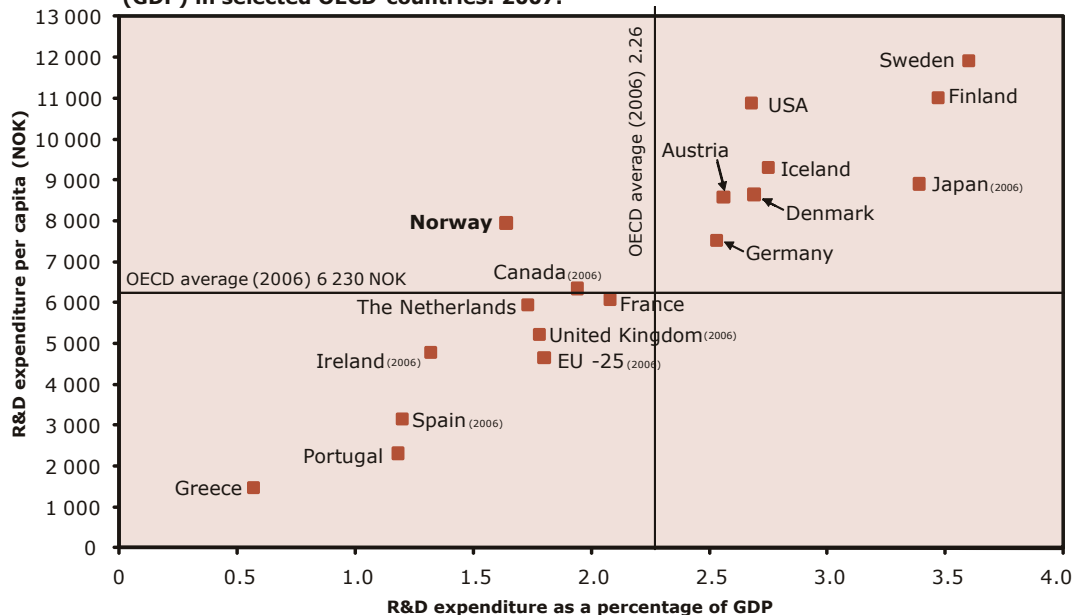
Sector of performance	Total	Source of funds						
		Industry		Government		Other national sources <sup>1</sup>	Abroad	
		Total	Of which: Oil companies	Total	Of which: Research Council of Norway		Total	Of which: EU-comm.
Industrial sector	17 381.7	14 136.0	1 574.9	825.2	333.2	444.5	1 975.9	56.6
Institute sector	8 309.9	1 753.5	507.1	5 382.0	1 896.3	312.0	862.4	253.7
Of which: Inst. serving enterprises	2 564.0	1 172.7	384.6	902.9	605.0	123.0	365.4	118.6
Government sector	5 745.9	580.8	122.5	4 479.1	1 291.3	189.0	497.0	135.1
Higher education sector	11 722.9	472.2	119.2	10 421.3	1 976.4	544.4	285.1	171.7
Of which: Univ. and spec.univ.inst.	10 231.3	207.8	119.2	9 238.2	1 856.5	519.7	265.6	159.4
State university colleges	1 491.7	264.4	-	1 183.1	119.9	24.7	19.5	12.3
Total	37 414.5	16 361.7	2 201.2	16 628.5	4 205.9	1 300.9	3 123.4	482.0

Source: R&D statistics, NIFU STEP/Statistics Norway

<sup>1</sup>Includes private funding, own funds and tax deduction funds (SkatteFUNN) in the Industrial sector.



**Figure 2 R&D expenditure per capita (NOK) and as a percentage of the Gross Domestic Product (GDP) in selected OECD-countries: 2007.**



Source: OECD Main Science and Technology Indicators 2008-2. National sources for Denmark, Iceland, Norway og Sweden

**Table 2 R&D expenditure as a percentage of the Gross Domestic Product (GDP) by source of funds, sector of performance and per capita (NOK) in selected OECD-countries: 2007.**

Country	R&D expenditure as a percentage of the GDP							R&D expenditure per capita NOK
	Total	Sector of performance			Source of funds <sup>2</sup>			
		Business enterprise sector <sup>1</sup>	Higher education sector	Government sector	Government	Industry	Abroad and other sources	
Austria	2.6	1.8	0.6	0.1	0.8	1.2	0.5	8 580
Canada <sup>(2006)</sup>	1.9	1.1	0.7	0.2	0.5	1.2	0.3	6 340
Denmark	2.7	1.9	0.6	0.1	0.6	1.8	0.2	8 640
Finland	3.5	2.5	0.7	0.3	1.3	1.8	0.3	11 000
France	2.1	1.3	0.4	0.3	0.6	1.2	0.2	6 080
Germany	2.5	1.8	0.4	0.4	1.0	1.2	0.3	7 510
Iceland	2.8	1.5	0.7	0.6	0.4	2.1	0.2	9 300
Ireland <sup>(2006)</sup>	1.3	0.9	0.3	0.1	0.6	0.6	0.2	4 790
Japan <sup>(2006)</sup>	3.4	2.6	0.4	0.3	1.9	1.2	0.3	8 900
Norway	1.6	0.8	0.5	0.3	0.7	0.8	0.2	7 950
Portugal	1.2	0.5	0.4	0.1	0.4	0.5	0.3	2 320
Spain <sup>(2006)</sup>	1.2	0.7	0.3	0.2	0.3	0.8	0.1	3 150
Sweden	3.6	2.6	0.8	0.2	1.0	2.5	0.1	11 920
United Kingdom <sup>(2006)</sup>	1.8	1.1	0.5	0.2	0.5	1.2	0.1	5 220
USA	2.7	1.9	0.4	0.3	1.0	1.3	0.4	10 880
Total OECD <sup>(2006)</sup>	2.3	1.6	0.4	0.3	0.6	1.4	0.2	6 230
EU - 25 <sup>(2006)</sup>	1.8	1.1	0.4	0.2	0.6	1.0	0.2	4 650

Source: OECD - Main Science and Technology Indicators 2008-2. National sources for Denmark, Iceland, Norway and Sweden

<sup>1</sup>In Norway, BES includes the Industrial sector and research institutes serving enterprises in the Institute sector.

<sup>2</sup>Where statistics are not available, data covers 2005/2006. (France, Germany, Iceland and Portugal).

**Table 3 Total R&D expenditure in Norway by source of funds and region: 2007. Mill. NOK.**

Region	Total	Industry	Government	Other national sources <sup>1</sup>	Abroad	Per capita NOK
Oslo and Akershus	15 839.3	6 213.2	7 557.6	543.7	1 524.7	14 680
Hedmark and Oppland	749.3	418.3	270.9	18.4	41.8	2 010
Eastern Norway <sup>2</sup>	3 959.0	2 826.3	694.1	117.5	321.0	4 360
Agder counties	951.0	468.3	326.8	42.7	113.1	3 500
Western Norway <sup>3</sup>	6 772.5	2 973.0	3 226.9	278.3	294.3	6 900
Middle Norway <sup>4</sup>	6 982.9	3 001.4	3 002.0	227.3	752.1	10 580
Northern Norway <sup>5</sup>	2 160.8	461.3	1 550.3	73.1	76.1	4 680
Total	37 414.5	16 361.7	16 628.5	1 300.9	3 123.4	7 950

Source: R&D statistics, NIFU STEP/Statistics Norway

<sup>1</sup> Includes private funding, own funds and tax deduction funds (SkatteFUNN) in the Industrial sector.

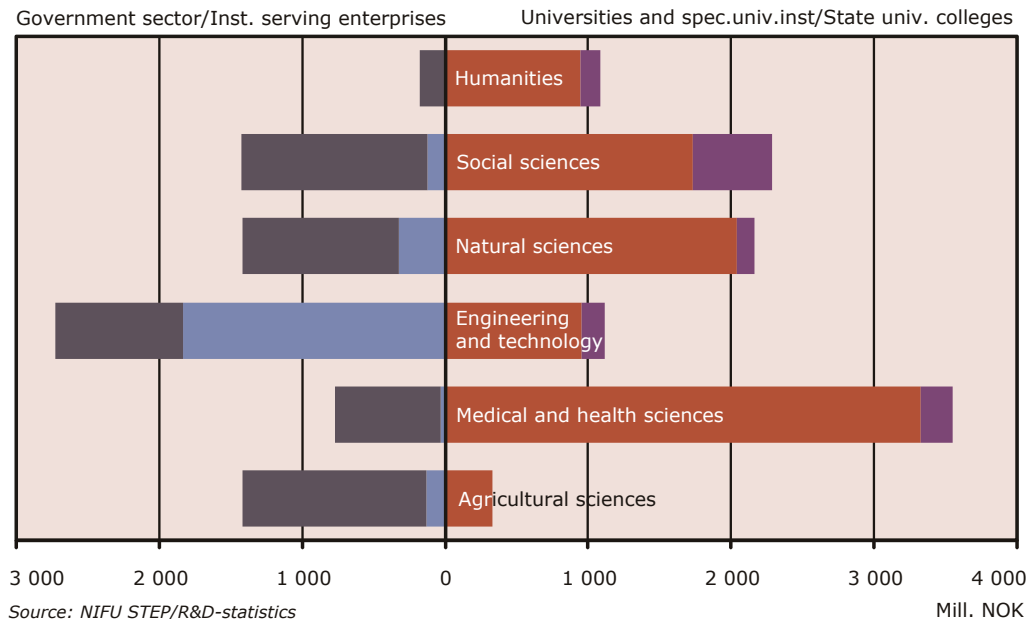
<sup>2</sup> Inkludes the counties of Buskerud, Telemark, Vestfold and Østfold.

<sup>3</sup> Inkludes the counties of Rogaland, Hordaland and Sogn og Fjordane.

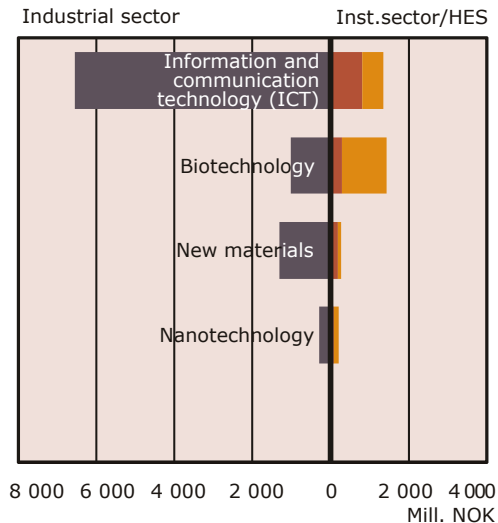
<sup>4</sup> Inkludes the counties of Sør-Trøndelag, Nord-Trøndelag and Møre og Romsdal.

<sup>5</sup> Also includes Svalbard.

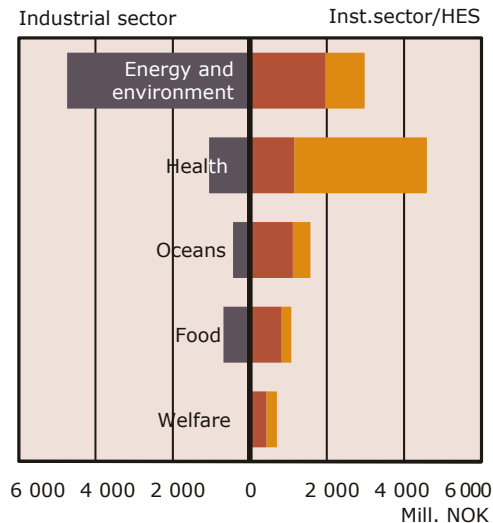
**Figure 3 Current expenditure on R&D in the Institute sector and the Higher education sector in Norway by type of institution and field of science: 2007.**



**Figure 4a Current expenditure on R&D in Norway by sector of performance and technology area: 2007**

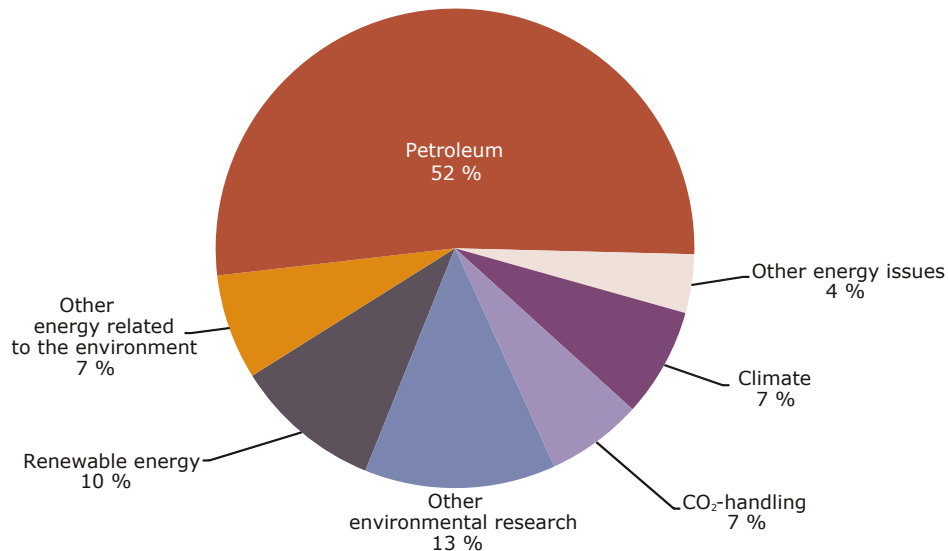


**Figure 4b Current expenditure on R&D in Norway by sector of performance and thematic priority: 2007.**



Source: R&D-statistics, NIFU STEP/Statistics Norway

**Figure 5 Current expenditure on R&D within the thematic priority Energy and environment in Norway: 2007. Percentage of 7,7 bill. NOK.**



Source: R&D-statistics, NIFU STEP/Statistics Norway

**Table 4 R&D resources in the Industrial sector in Norway by industry: 2007.**

Industry (SN 2002)	R&D expendi- ture Mill. NOK	Own funds Per cent	R&D person years (FTE)
Fishing, operations of fish hatcheries and fish farms (5)	277.7	71	166
Extraction of crude petroleum and natural gas (11)	1 297.9	86	720
Total industry and mining (13–37)	8 268.4	78	7 166
Of which: Chemicals and chemical products (23–24)	1 378.1	83	1 202
Machinery and equipment (29)	1 837.5	71	1 312
Electrical and optical equipment (30–33)	2 508.2	73	2 305
Transport equipment, furniture and other (34–37)	792.8	89	696
Other industry and mining	1 751.8	83	1 651
Electricity, gas and water supply (40–41)	78.4	53	55
Construction (45)	128.9	93	141
Total services (50–99)	7 330.4	73	7 050
Of which: Transport and telecommunication (60–64.2)	680.5	86	535
Financial intermediation (65–67)	916.3	97	781
Computer and related activities (72)	3 106.1	78	2 929
Other business activities and consultant services (74)	1 604.2	50	1 176
Other services	1 023.3	61	1 629
Total	17 381.7	76	15 299

Source: Statistics Norway/R&D-statistics

**Table 5 Total current expenditure<sup>1</sup> and current expenditure on R&D in Norwegian health trusts by type of health trust and region: 2007. Million NOK and per cent.**

Health region	University hospitals			Non-university hospitals		
	Total current expenditure <sup>2</sup> Mill. NOK	Current expenditure on R&D	Share of R&D %	Total current expenditure Mill. NOK	Current expenditure on R&D	Share of R&D %
Middle Norway	5 931	174	2.9	5 775	25	0.4
Northern Norway	4 853	150	3.1	5 161	18	0.3
South-Eastern Norway	21 294	1 200	5.6	25 535	187	0.7
Western Norway	10 749	293	2.7	4 432	13	0.3
Total	42 827	1 817	4.2	40 903	243	0.6

Source: NIFU STEP/Statistics Norway

<sup>1</sup> Current expenditure includes depreciations.

<sup>2</sup> The Cancer register, Medinnova and Innovest are not included.



**Table 6 R&D personnel, head count and full time equivalents (FTE), in Norway by sector of performance: 2007.**

Sector of performance	R&D personnel (head count)			Full time equivalents	
	Total R&D personnel	Of which: Re-searchers	Technical/ adm.staff	Total	Of which: Re-searchers
Industrial sector <sup>1</sup>	21 922	14 493	7 429	15 299	10 790
Institute sector	10 618	7 467	3 151	7 796	5 523
<i>Of which: Research inst. serving enterprises</i>	2 594	1 982	612	2 093	1 626
<i>Government sector</i>	8 024	5 485	2 539	5 703	3 896
Higher education sector	27 074	19 812	7 262	11 011	8 747
<i>Of which: Universities</i>	18 488	12 694	5 794	9 148	7 075
<i>Specialized univ. institutions</i>	1 879	1 530	349	693	603
<i>State university colleges</i>	6 707	5 588	1 119	1 170	1 069
Total	59 614	41 772	17 842	34 106	25 060

Source: R&D-statistics, NIFU STEP/Statistics Norway

<sup>1</sup>Researchers in the Industrial sector includes R&D personnel with higher education.

**Table 7 Researchers (head count) in Norway by sector of performance: 2007.**  
**Women and doctorates.**

Sector of performance	Total			Doctorates <sup>1</sup>			
	Total	Women		Total		Women	
	Number	Number	%	Number	%	Number	%
Higher education sector	19 812	8 349	42	7 298	37	2 292	27
Of which: Universities	12 694	5 014	39	5 753	45	1 791	36
Specialized university institutions	1 530	590	39	501	33	141	24
State university colleges	5 588	2 745	49	1 043	19	360	13
Institute sector	7 467	2 730	37	2 758	37	892	33
Of which: Research inst. serving enterprises	1 982	533	27	772	39	199	37
Government sector	5 485	2 197	40	1 986	36	693	32
Industrial sector <sup>2</sup>	14 493	2 854	20	1 302	9	266	9
Total	41 772	13 933	33	11 358	27	3 450	25

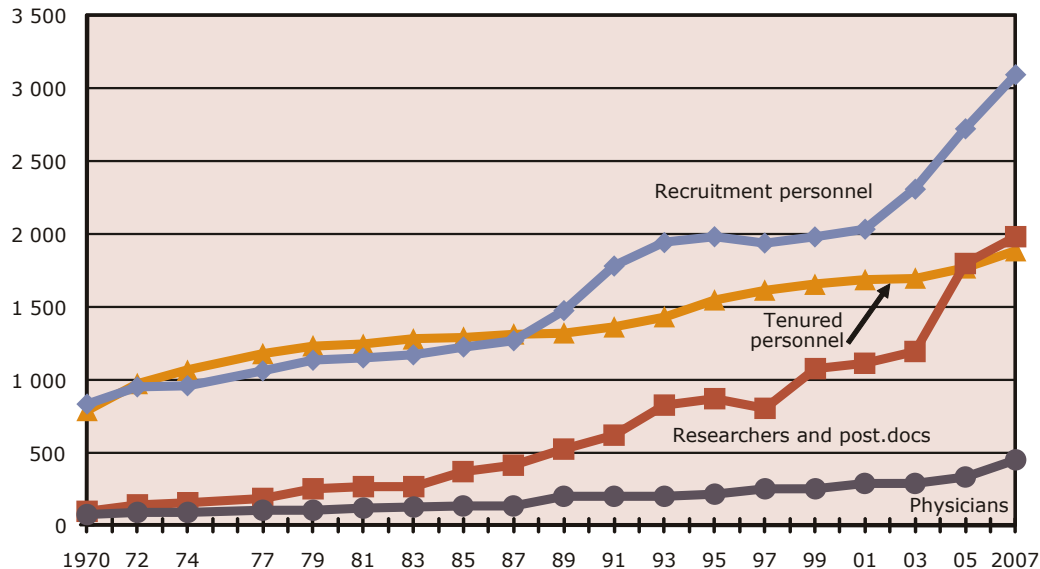
Source: NIFU STEP/Statistics Norway

<sup>1</sup>Licensiates are included.

<sup>2</sup>Researchers in the Industrial sector includes R&D personnel with higher education.

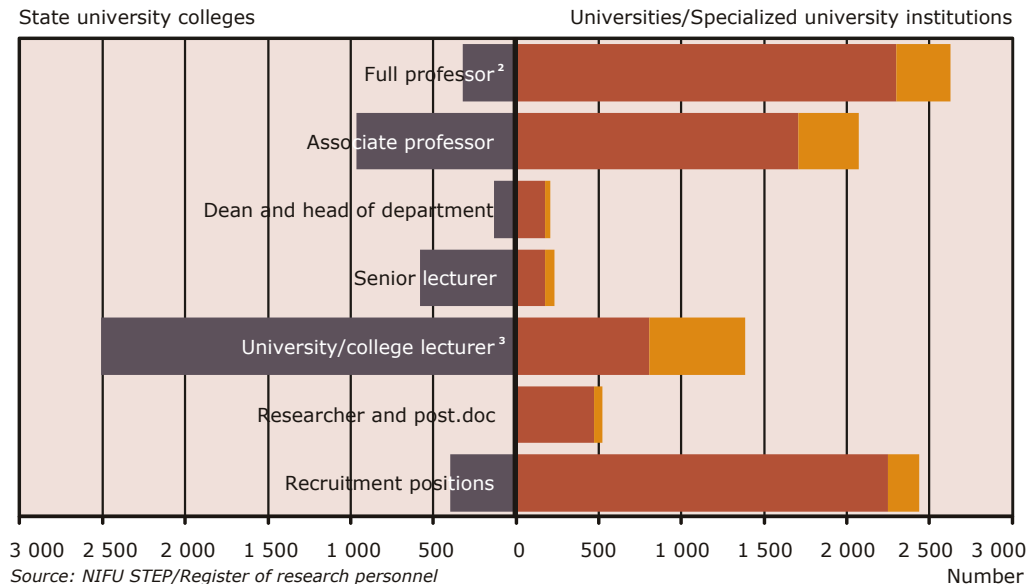
**Figure 6 Researchers (FTE) at universities and specialized university institutions in Norway by category: 1970–2007.**

Full time equivalent



Source: NIFU STEP/Register of research personnel

**Figure 7 Researchers (head count) financed by general university funds in the Higher education sector in Norway by type of institution and position: 2008.<sup>1</sup>**



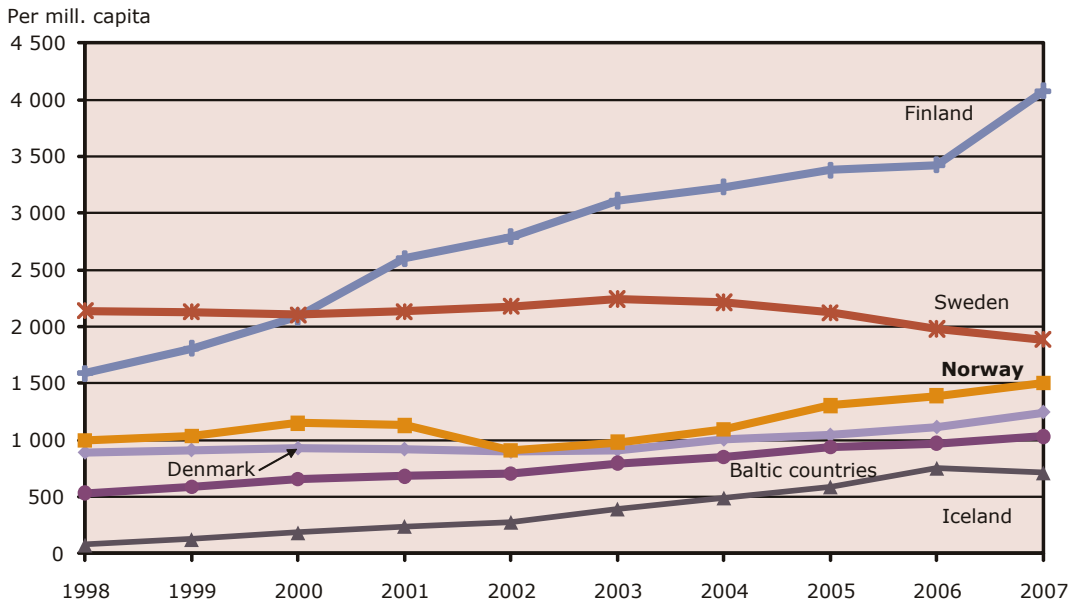
<sup>1</sup> Preliminary numbers. <sup>2</sup> Includes college readers. <sup>3</sup> Includes assistant professors and special teaching positions.

**Table 8 Government budget appropriations or outlays for R&D (GBAORD) by socio-economic objective, including R&D performed abroad. Final budget: 2007, 2008, 2009. Mill. NOK.**

Socio-economic objective	2007	2008	2009
Agriculture, forestry and fishery	1 321	1 360	1 444
Of which: fishery	769	804	868
Industrial development	1 208	1 254	1 413
Production and distribution of energy	467	469	679
Transport og telecommunications	386	423	458
Living conditions and physical planning	24	29	27
Environment	311	354	478
Health	2 632	2 831	2 920
Social conditions	323	371	412
Culture, mass media and leisure	159	173	158
Education	137	142	144
Working conditions	41	43	46
Economic planning and public administration	476	500	531
Exploration and exploitation of the earth and atmosphere	373	423	375
General advancement of knowledge	8 237	8 630	9 198
Space research	453	460	447
Defence	885	895	915
EU-contingent	658	1 000	1 120
<b>Total</b>	<b>18 091</b>	<b>19 357</b>	<b>20 765</b>

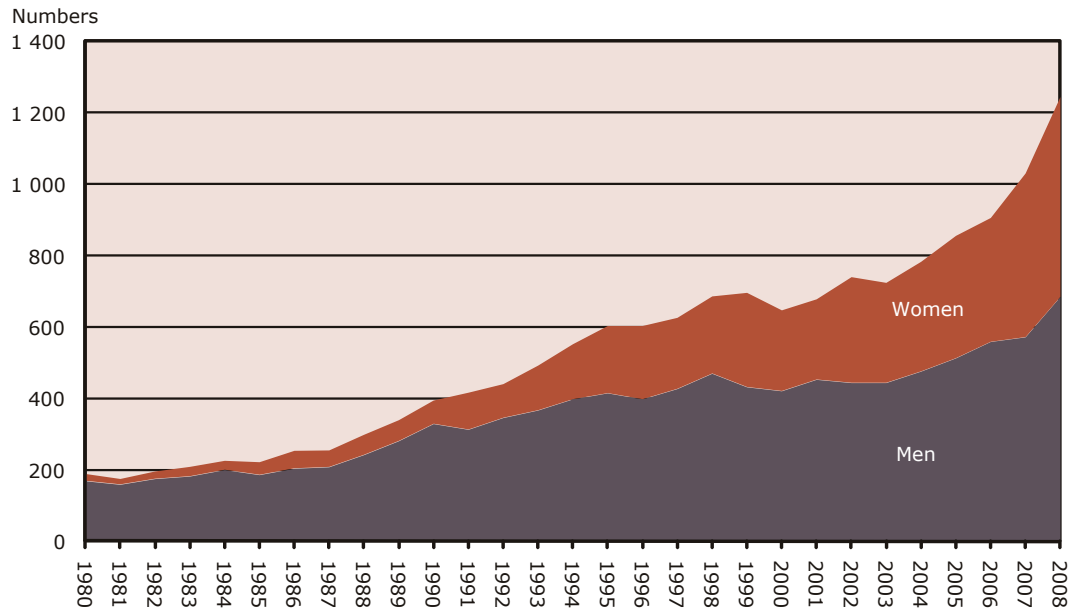
Source: NIFU STEP

**Figure 8 Doktoral students per mill. capita in the Nordic and Baltic countries: 1998–2007.**



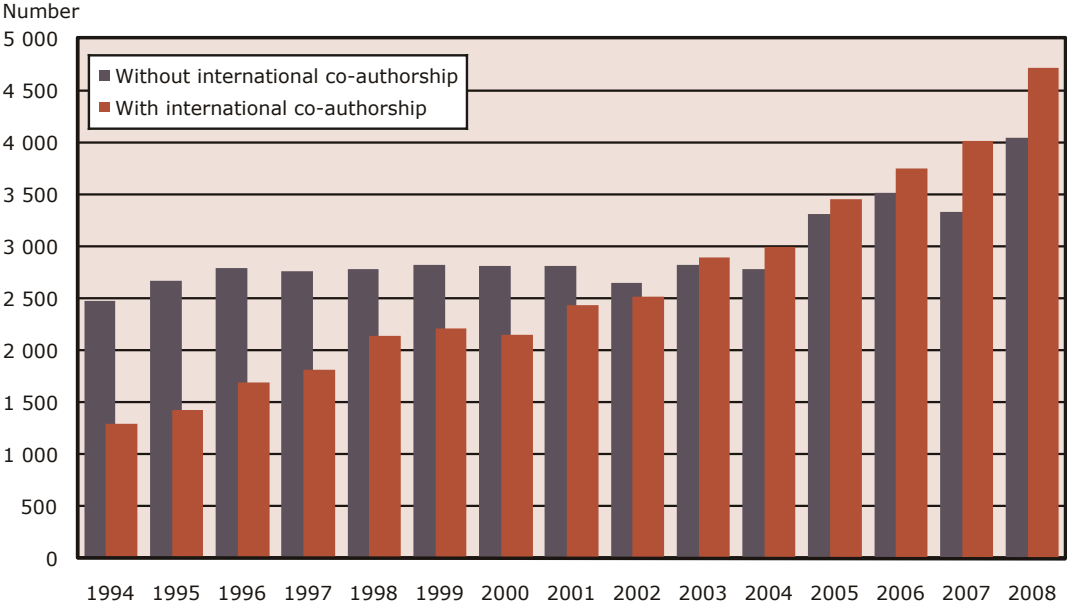
Source: NORBAL

**Figure 9 Awarded doctoral degrees in Norway by gender: 1980–2008.**



Source: NIFU STEP/Doctoral degree register

**Figure 10 Norwegian articles with and without international co-authorship: 1994–2008.**



Source: National Citation Report for Norway, 2008, Thomson Reuters