

# Science and Technology Indicators

2010 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 2009, The Norwegian Research Council, Oslo, 2009*. The internet version of the report is updated with statistics for 2008, 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\$ = 9.05 NOK in 2007 (Main Science and Technology Indicators 2009-2, OECD), by May 2010 1 Euro = 7.8 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 the database *National Science Indicators* prepared by the *Thomson Scientific* in the U.S. This database contains publication and citation statistics worldwide.

## 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 merged into the Government sector in international statistics presentations.

## Highlights

- Total R&D expenditure in Norway amounted to 41.2 billion NOK in 2008, compared to 37.4 billion in 2007.
- R&D expenditure accounted for 1.64 per cent of the GDP in 2007. *Estimate for 2008: 1.62.*
- Among selected OECD countries Norway, Portugal, Spain and Iceland had the highest shares of R&D expenditure financed by public sources in 2007, and Japan, Finland, Germany and the United States had the highest shares of funding from industry.
- 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.
- For countries with higher R&D expenditure per capita than the OECD average of 6 813 NOK, Norway is the only country with lower share of R&D expenditure of GDP than the OECD average 2.28 per cent.
- Several OECD countries have experienced large real growth in R&D expenditure between 1997 and 2007. For the large R&D nations, Sweden's increase in R&D corresponds to the OECD average of 40 per cent, while Finland and Japan are above average and the United States below.
- In 2008 R&D expenditure in the Industrial sector amounted to 19 billion NOK, 13 billion in the Higher education sector and 9.3 billion in the Institute sector. Salaries incl. social costs had the highest share of R&D expenditure in the Industrial sector with 68 per cent of current R&D expenditure. Higher education sector and Institute sector had corresponding shares of 62 and 59 per cent, respectively.
- Manufacturing and service sector had 45 per cent of the Industrial sector's R&D expenditure each. Construction had the largest share of own funding.
- 65 per cent of researchers performing R&D at the health trusts in 2008 were engaged as physicians. The Health region South eastern Norway had the highest share of research positions and research fellows, 48 per cent.
- 62 853 persons participated in R&D in Norway in 2008, performing 35 984 full time equivalents (FTE).
- About 44 200 persons of the total R&D personnel were researchers, and 34 per cent of them were women. The State university colleges had the highest share of female researchers; 51 per cent in 2008, while Industrial sector's share was 20 per cent. 25 per cent of the researchers had a doctoral degree.
- In 2009, 1 248 doctoral degrees were awarded in Norway, a decrease by 90 degrees from 2008, following two years with high growth. The share of women was 45 per cent, as in 2007 and 2008.
- The number of Norwegian scientific articles with international co-authorship has increased by 9 per cent per year between 1999 and 2009, compared to 4 per cent growth in articles without international co-authorship.

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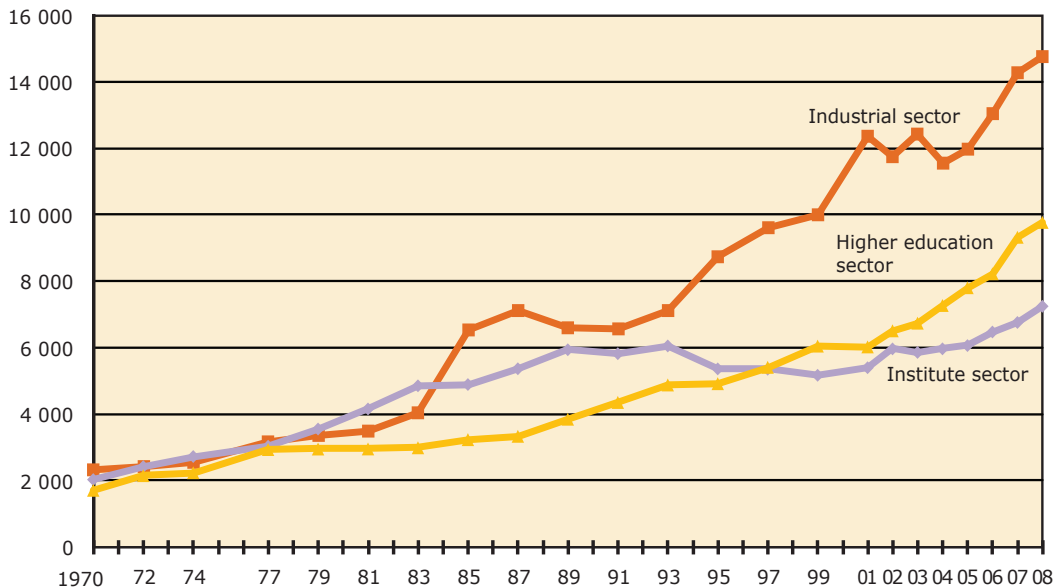
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**Figure 1 R&D expenditure in Norway by sector of performance. 1970–2008. Fixed 2000-prices.**

Mill. NOK



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

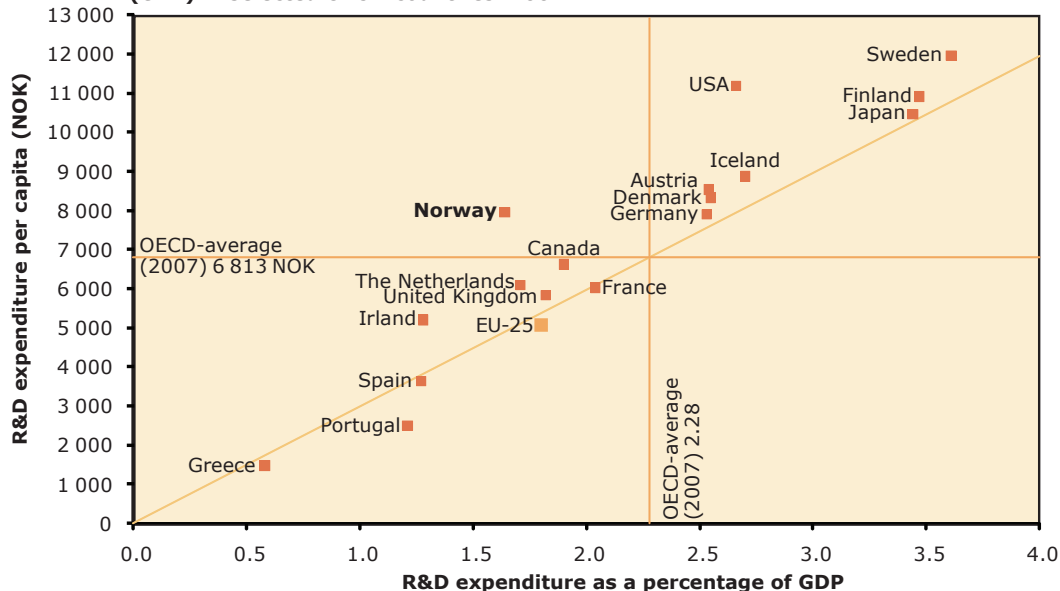
**Table 1 R&D expenditure in Norway by sector of performance and type of cost: 2008. Mill. NOK.**

Sector of performance	Total	Type of cost				
		Current expenditure		Capital expenditure		
		Total	Of which: Labour costs	Total	Of which: Instruments and equip- ment	Land and buildings
Industrial sector	18 974	17 608	12 006	1 366	1 243	123
Institute sector	9 267	8 813	5 482	454	325	129
<i>Of which: Health trusts without university functions</i>	281	274	211	7	7	..
Higher education sector	12 984	11 613	6 803	1 371	452	919
<i>Of which: Health trusts with university functions</i>	2 189	1 966	1 366	223	12	211
Total	41 225	38 034	24 292	3 191	2 021	12 984

Kilde: FoU-statistikk, NIFU STEP/SSB



**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 2009-2. National sources for Denmark, Iceland, Norway and Sweden

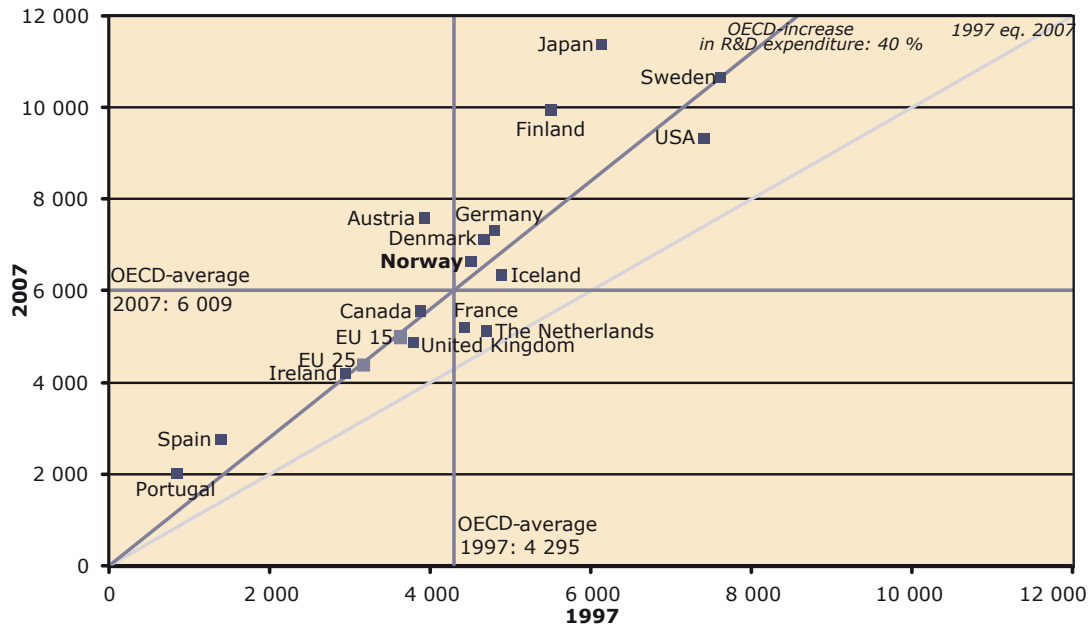
**Table 2 R&D expenditure as a percentage of the Gross Domestic Product (GDP) by source of funds, sector of performance and per capita (NOK) in selected OECD-countries: 2007.**

Country	R&D expenditure as a percentage of the GDP							R&D expenditure per capita NOK
	Total	Sector of performance			Source of funds			
		Business enterprise sector <sup>1</sup>	Higher education sector	Government sector	Government	Industry	Abroad and other sources	
Austria	2.54	1.79	0.61	0.16	0.82	1.24	0.48	8 532
Canada	1.90	1.03	0.66	0.21	0.63	0.91	0.37	6 617
Denmark	2.55	1.77	0.68	0.11	0.66	1.54	0.34	8 329
Finland	3.47	2.51	0.65	0.33	0.83	2.37	0.27	10 910
France	2.04	1.29	0.40	0.34	0.78	1.06	0.20	6 030
Germany	2.53	1.77	0.41	0.35	0.70	1.72	0.11	7 896
Iceland	2.70	1.47	0.68	0.51	1.05	1.36	0.29	8 869
Ireland	1.28	0.84	0.35	0.09	0.41	0.63	0.23	5 203
Japan	3.44	2.68	0.43	0.30	0.54	2.67	0.23	10 467
<b>Norway</b>	<b>1.64</b>	<b>0.87</b>	<b>0.51</b>	<b>0.25</b>	<b>0.74</b>	<b>0.74</b>	<b>0.16</b>	<b>7 947</b>
Portugal	1.21	0.62	0.36	0.13	0.54	0.57	0.10	2 497
Spain	1.27	0.71	0.33	0.24	0.55	0.58	0.14	3 630
Sweden	3.61	2.66	0.77	0.21	0.80	2.31	0.50	11 949
United Kingdom	1.82	1.15	0.47	0.18	0.55	0.85	0.42	5 838
USA	2.66	1.92	0.35	0.32	0.75	1.76	0.15	11 188
Total OECD	2.28	1.59	0.39	0.27	0.64	1.46	0.18	6 813
EU - 25	1.80	1.14	0.41	0.25	0.60	0.99	0.21	5 069

Source: OECD - Main Science and Technology Indicators 2009-2. 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.

**Figure 3 Total R&D expenditure per capita in 1997 og 2007 for selected countries and OECD.  
Fixed 2000-prices. Level and relative increase.**



**Table 3 Government budget appropriations or outlays for R&D (GBAORD) by socio-economic objective, including R&D performed abroad. Final budget: 2008, 2009, 2010.**

Socio-economic objective	2008	2009	2010
Agriculture, forestry and fishery	1 360	1 444	1 513
<i>Of which: fishery</i>	804	868	915
Industrial development	1 254	1 413	1 534
Production and distribution of energy	469	679	881
Transport og telecommunications	423	458	497
Living conditions and physical planning	29	27	23
Environment	354	463	477
Health	2 831	2 920	3 055
Social conditions	371	412	440
Culture, mass media and leisure	173	164	168
Education	142	144	148
Working conditions	43	46	47
Economic planning and public administration	500	531	556
Exploration and exploitation of the earth and atmosphere	423	375	366
General advancement of knowledge	8 630	9 207	9 930
Space research	460	447	630
Defence	895	915	940
EU-contingent	1 000	1 120	1 236
<b>Total</b>	<b>19 357</b>	<b>20 765</b>	<b>22 441</b>

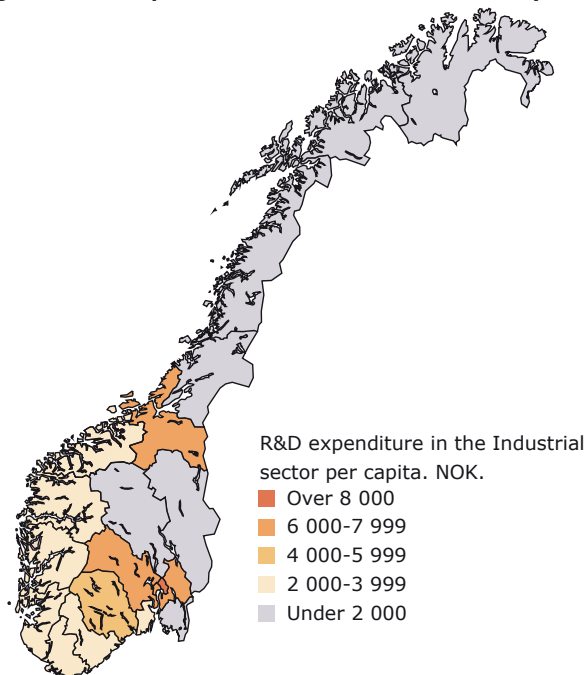
Source: NIFU STEP

**Table 4 R&D resources in the Industrial sector in Norway by industry: 2008.**

Industry (SN 2007)	R&D expenditure Mill. NOK	Own funds Percent	R&D Person years (FTE)
Fishing, operations of fish hatcheries and fish farms (A03)	316	66	211
Mining (B05-B09)	1 256	87	725
<i>Of which: Extraction of petroleum and natural gas (B06,B09.1)</i>	<i>1 231</i>	<i>87</i>	<i>708</i>
Total manufacture (C10-C33)	8 630	75	7 360
<i>Of which: Manufacture of food products and beverages (C10-C11)</i>	<i>617</i>	<i>85</i>	<i>531</i>
<i>    Manufacture of coke, refined petroleum products, chemicals and chemical products (C19-C20)</i>	<i>1 072</i>	<i>79</i>	<i>824</i>
<i>    Manufacture of fabricated metal products (C25)</i>	<i>1 210</i>	<i>72</i>	<i>864</i>
<i>    Manufacture of computer, electronic and optical products (C26)</i>	<i>1 861</i>	<i>66</i>	<i>1 814</i>
<i>    Manufacture of machinery and equipment n.e.c. (C28)</i>	<i>1 054</i>	<i>65</i>	<i>713</i>
<i>    Other manufacture</i>	<i>2 817</i>	<i>83</i>	<i>2 614</i>
Electricity, gas, steam and air conditioning supply (D35)	107	49	69
Water supply, sewerage, waste management and remediation activities (E36-E39)	33	69	18
Construction (F41-F43)	179	92	159
Total services (G-N)	8 453	74	7 937
<i>Of which: Publishing activities (J58)</i>	<i>1 298</i>	<i>87</i>	<i>1 526</i>
<i>    Computer programming; consultancy and related activities (J62)</i>	<i>2 111</i>	<i>70</i>	<i>2 176</i>
<i>    Architectural and engineering activities; technical testing and analysis (M71)</i>	<i>1 771</i>	<i>55</i>	<i>1 246</i>
<i>    Other services</i>	<i>3 273</i>	<i>81</i>	<i>2 989</i>
Total	18 974	75	16 479

Source: Statistics Norway/R&amp;D statistics

**Figure 4 R&D expenditure in the Industrial sector by county and per capita 2008. NOK and mill. NOK.**



Industrial R&D expenditure		
County	Per capita NOK	Total Mill. NOK
Østfold	1 443	383
Akershus	6 001	3 112
Oslo	9 271	5 196
Hedmark	391	74
Oppland	1 933	355
Buskerud	6 847	1 720
Vestfold	3 529	799
Telemark	4 072	679
Aust-Agder	2 798	297
Vest-Agder	3 652	606
Rogaland	3 111	1 284
Hordaland	3 091	1 430
Sogn og Fjordane	2 099	223
Møre og Romsdal	2 391	590
Sør-Trøndelag	6 894	1 951
Nord-Trøndelag	1 317	171
Nordland	1 128	265
Troms	1 054	163
Finnmark	69	5

Map: Norwegian mapping authority  
Source: Statistics Norway

**Table 5 R&D personnel by sector of performance in Norway: 2008. Head count and full time equivalents.**

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	23 959	15 858	8 101	16 478	11 467
Institute sector	11 111	7 713	3 398	8 165	5 796
<i>Of which: Institutes serving enterprises</i>	<i>3 011</i>	<i>2 177</i>	<i>834</i>	<i>2 495</i>	<i>1 850</i>
<i>Institutes serving government sector</i>	<i>7 409</i>	<i>5 112</i>	<i>2 295</i>	<i>5 372</i>	<i>3 732</i>
<i>Health trusts<sup>1</sup></i>	<i>691</i>	<i>424</i>	<i>269</i>	<i>298</i>	<i>214</i>
Higher education sector	28 092	20 590	7 502	11 341	8 771
<i>Of which: Universities</i>	<i>15 890</i>	<i>11 173</i>	<i>4 717</i>	<i>..</i>	<i>..</i>
<i>Specialized university institutions</i>	<i>1 893</i>	<i>1 563</i>	<i>330</i>	<i>..</i>	<i>..</i>
<i>State university colleges</i>	<i>6 260</i>	<i>5 204</i>	<i>1 056</i>	<i>..</i>	<i>..</i>
<i>Health trusts<sup>2</sup></i>	<i>4 049</i>	<i>2 650</i>	<i>1 399</i>	<i>1 974</i>	<i>1 160</i>
Total	63 162	44 161	19 001	35 984	26 033

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

<sup>1</sup>Health trusts without university functions.

<sup>2</sup>Health trusts with university functions.

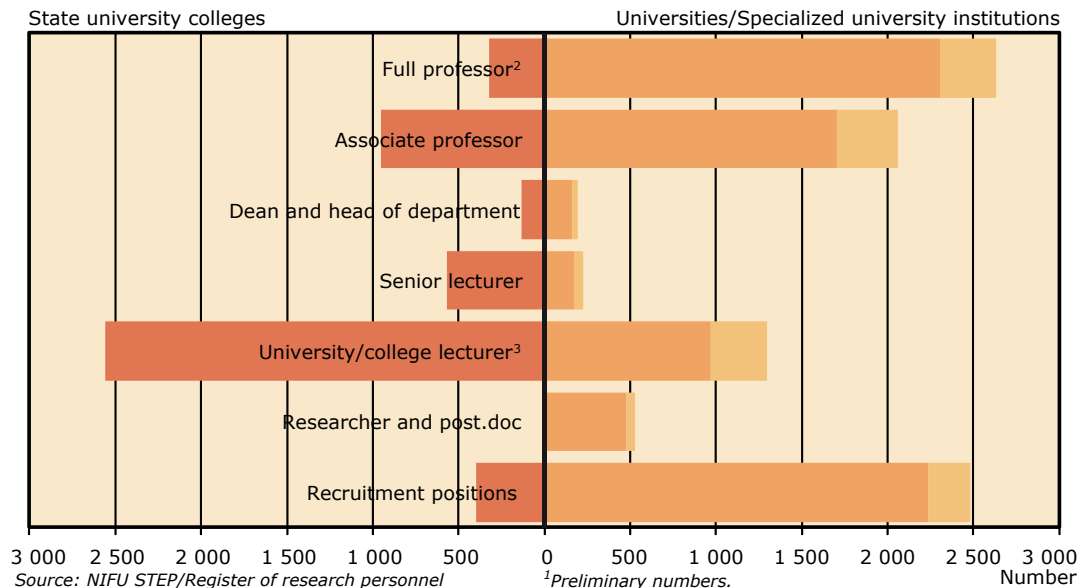
**Table 6 Researchers in Norwegian health trusts by type of health trust, region and position:  
2008. Head count.**

Health region	Health trust with university functions				Health trust without university functions			
	Total	Physicians	Re- searchers	Recruit- ment personnel	Total	Physicians	Re- searchers	Recruit- ment personnel
Middle Norway	244	232	7	5	51	43	1	7
Northern Norway	265	160	54	51	38	35	2	1
South-Eastern Norway	1 434	739	442	253	311	193	59	59
Western Norway	707	584	54	69	24	20	1	3
Total	2 650	1 715	557	378	424	291	63	70

*Source: NIFU STEP/ Register of research personnel*



**Figure 5 Researchers (head count) financed by general university funds in the Higher education sector in Norway by type of institution and position: 2009<sup>1</sup>.**



<sup>1</sup>Preliminary numbers.

<sup>2</sup>Includes college readers.

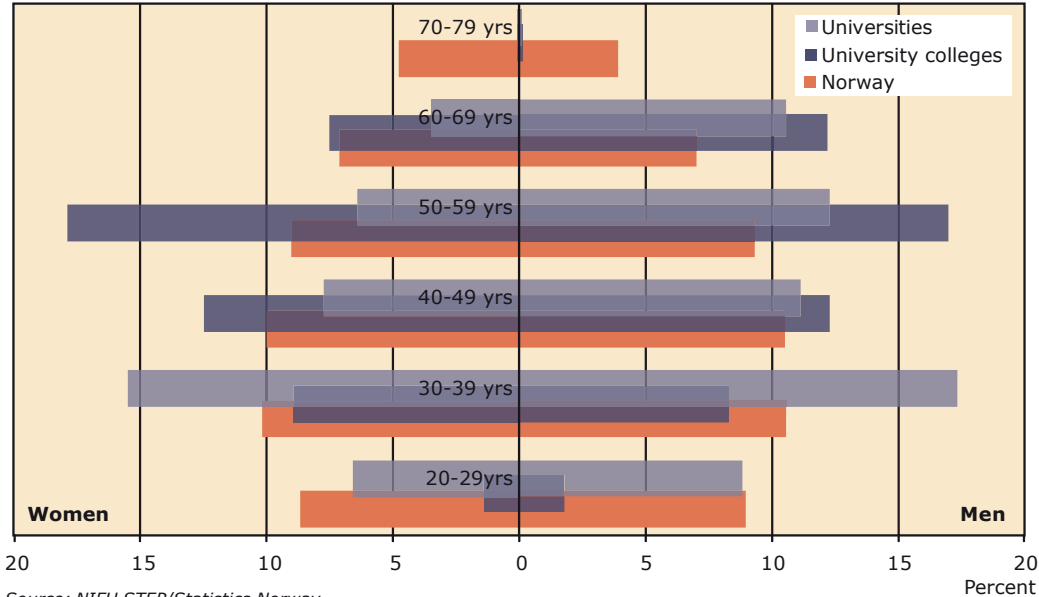
<sup>3</sup>Includes assistant professors and special teaching positions.

**Table 7 Researchers in Norway by sector of performance: 2008. Women and doctorates.  
Head count.**

Sector of performance	Total			Doctorates <sup>1</sup>			
	Total	Women		Total		Women	
	Number	Number	%	Number	%	Number	%
Higher education sector	17 940	7 693	43	6 801	38	2 245	29
<i>Of which: Universities</i>	<i>11 173</i>	<i>4 435</i>	<i>40</i>	<i>5 231</i>	<i>47</i>	<i>1 701</i>	<i>38</i>
<i>Specialized university institutions</i>	<i>1 563</i>	<i>615</i>	<i>39</i>	<i>544</i>	<i>35</i>	<i>167</i>	<i>27</i>
<i>State university colleges</i>	<i>5 204</i>	<i>2 643</i>	<i>51</i>	<i>1 026</i>	<i>20</i>	<i>377</i>	<i>14</i>
Institute sector	7 289	2 748	38	2 863	39	967	35
<i>Of which: Research inst. serving enterprises</i>	<i>2 177</i>	<i>651</i>	<i>30</i>	<i>929</i>	<i>43</i>	<i>269</i>	<i>41</i>
<i>Research inst. serving government sector</i>	<i>5 112</i>	<i>2 097</i>	<i>41</i>	<i>1 934</i>	<i>38</i>	<i>698</i>	<i>33</i>
Health trusts	3 074	1 361	44	1 177	38	377	28
<i>Of which: With university functions</i>	<i>2 650</i>	<i>1 184</i>	<i>45</i>	<i>1 088</i>	<i>41</i>	<i>354</i>	<i>30</i>
<i>Without university functions</i>	<i>424</i>	<i>177</i>	<i>42</i>	<i>89</i>	<i>21</i>	<i>23</i>	<i>13</i>
Industrial sector	15 858	3 169	20	1 573	10	301	9
<b>Total</b>	<b>44 161</b>	<b>14 971</b>	<b>34</b>	<b>10 841</b>	<b>25</b>	<b>3 589</b>	<b>24</b>

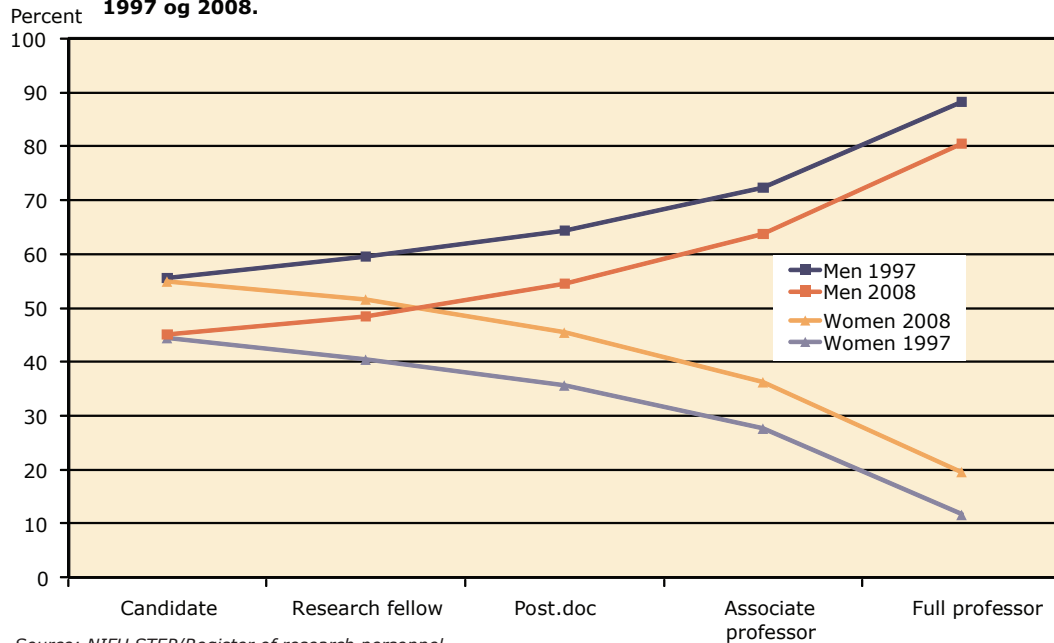
Source: NIFU STEP/Statistics Norway  
<sup>1</sup> Licenciates are also included

**Figure 6 Researchers (head count) by gender and given age groups. Universities, Specialized university institutions/State university colleges and the Norwegian population: 2008. Percentage of the selection.**

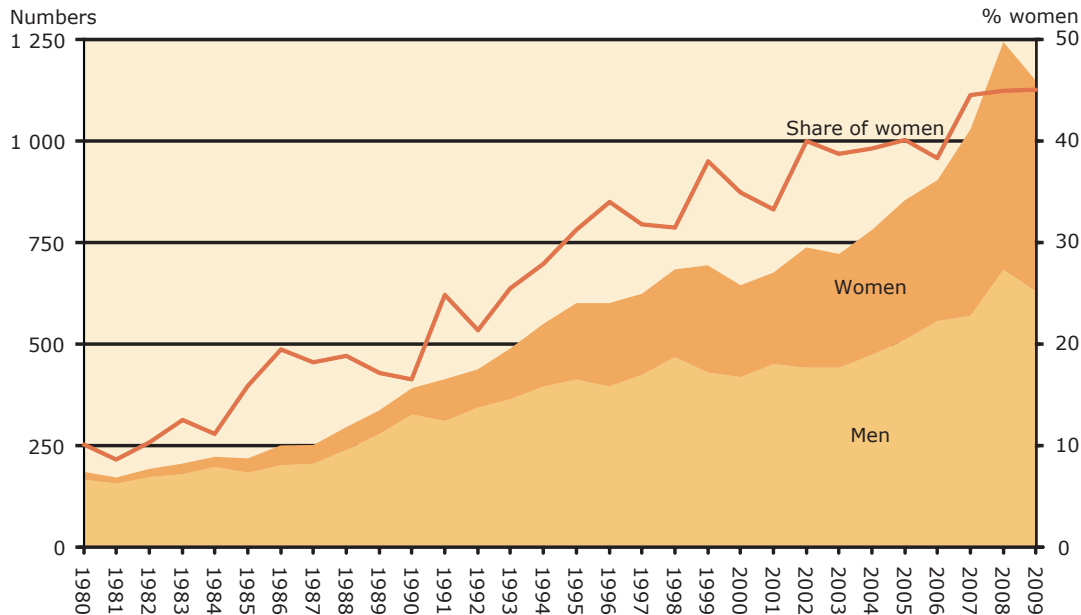


Source: NIFU STEP/Statistics Norway

**Figure 7 Proportions of men and women for typical career steps in the Higher education sector. 1997 og 2008.**

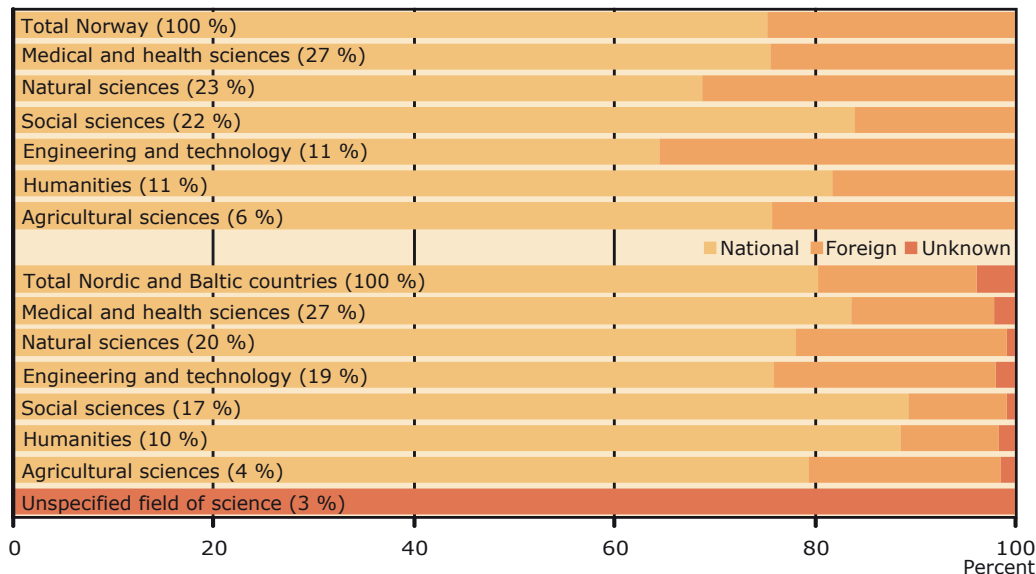


**Figure 8 Awarded doctoral degrees in Norway by gender: 1980-2009.**



Source: NIFU STEP/Doctoral degree register

**Figure 9 Awarded doctoral degrees in 2008 by citizenship and field of science. Norway and the Nordic/Baltic<sup>1</sup> countries<sup>2</sup>. Percent and field of science's share in total.**

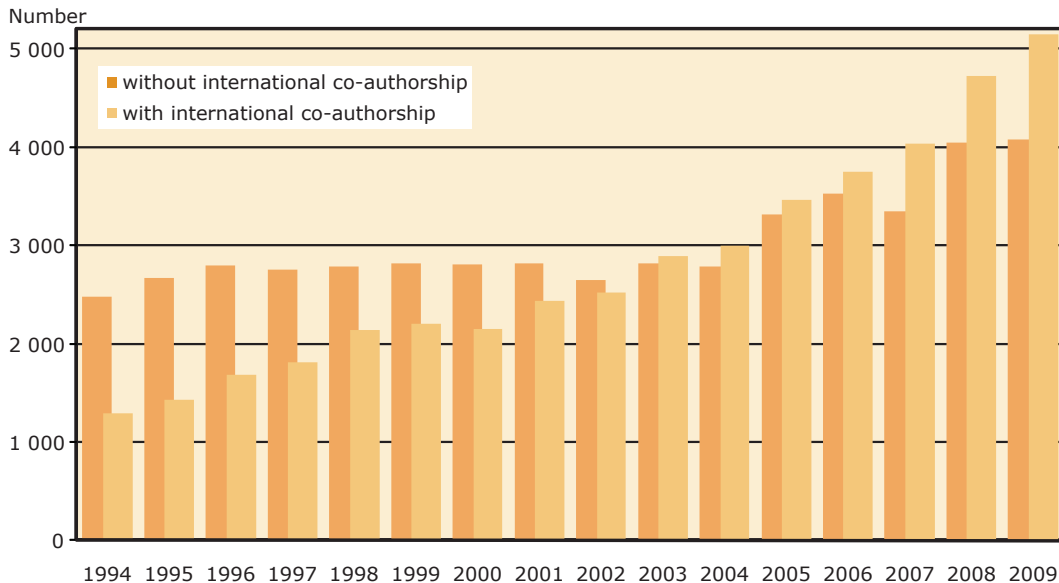


<sup>1</sup>The NORBAL database includes: Norway, Sweden, Denmark, Finland, Iceland, Estonia, Lithuania and Latvia.

<sup>2</sup>Awarded doctoral degrees by citizenship are not available for Latvia.

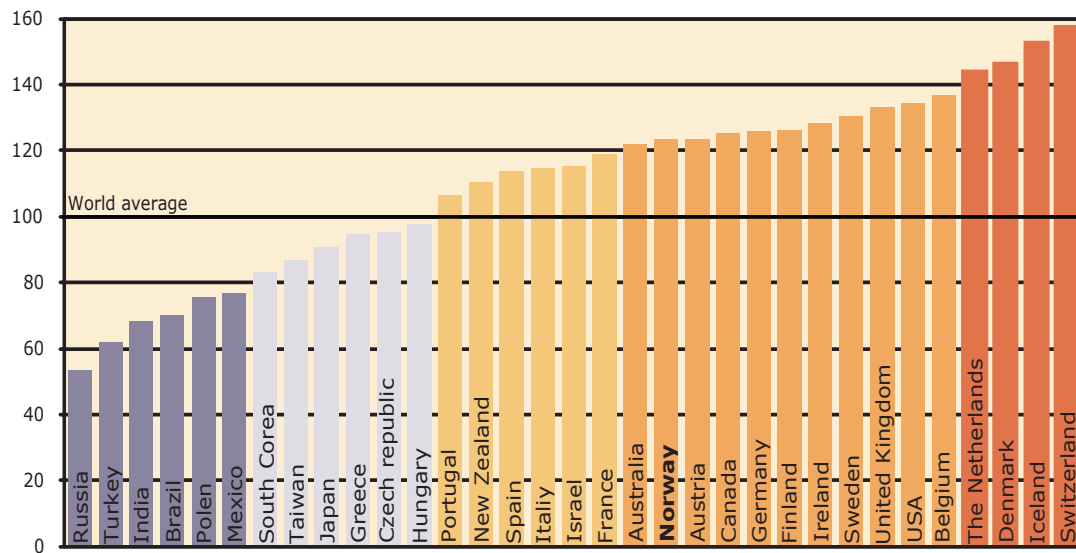
Source: NIFU STEP/NORBAL

**Figure 10 Norwegian articles with and without international co-authorship: 1994-2009.**



Kilde: Citation Report for Norway, Institute for Scientific Information (ISI)

**Figure 11 Relative index of citations for published articles 2006-2008<sup>1</sup>. Selected countries.**



Source: National Science Indicators/Thomson Reuters/NIFU STEP

<sup>1</sup>Based on the publications from the period 2006-2008 and the accumulated citations to these publications through 2009. The index for each country has been weighted according to the countries' relative field distribution of articles.